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ABSTRACT

Proceedings of the Conference on Environmental Impact Analysis held in Green Bay, Wisconsin, January 4-5, 1972, are compiled in this report. The conference served as a forum for exchange of information among State and Federal agencies and educators on experiences with the National Environmental Policy Act of 1970. Hopefully, results of the conference will be manifested in improved conception and analysis of public works projects. The 16 major presentations dealt with several areas of concern: impact of the National Environmental Policy Act; how the Act has been implemented and some of the problems arising from it in the past two years; environmental impact perspectives exemplified by a systems approach to governmental decision-making and the total institution-wide emphasis on man and his environment by the University of Wisconsin-Green Bay; impact assessment dimensions as conceptualization, communication, social aspects, and the application of mathematics; and procedures and programs for environmental impact assessment. Text of the Act appears in the appendix together with various aspects of impact statements--preparation process, sources for, summary of those already filed, and Federal agency contacts. (BL)

ENVIRONMENTAL IMPACT ANALYSIS:
PHILOSOPHY & METHODS

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edited by robert b. ditton and thomas l. goodale

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ENVIRONMENTAL IMPACT ANALYSIS:
PHILOSOPHY & METHODS

Edited by Robert B. Ditton and Thomas L. Goodale

Proceedings of the Conference on
Environmental Impact Analysis
Green Bay, Wisconsin
January 4-5, 1972

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FOREWORD

The National Environmental Policy Act of 1970 has among its purposes:

> "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent and eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and national resources importance to the nation; . . ."

Since this Act initiates substantial changes in our Nation's environmental goals, its implementations have created numerous certainties and problems. The conference served as a forum for exchange of information among State and Federal agencies and educators on experiences with the Environmental Policy Act. The results of the conference will be manifest in improved conception and analysis of public works projects.

This conference was supported by University of Wisconsin-Extension, UW-Green Bay, and the UW-Sea Grant Program. The University of Wisconsin's Sea Grant Program is a part of the National Sea Grant Program, which is maintained by the National Oceanic and Atmospheric Administration of the U. S. Department of Commerce.

Professors Robert B. Ditton and Thomas L. Goodale of the University of Wisconsin-Green Bay have performed an important service in organizing a timely effort to discuss an important national goal in the formative stages of its implementation.

MARVIN T. BEATTY
Chairman
Environmental Resources Unit
University of Wisconsin-Extension

GREGORY D. HEDDEN
Director of University Extension
Sea Grant Program

ROLLIN B. POSEY
Dean
School of Professional Studies
University of Wisconsin-Green Bay

ACKNOWLEDGMENTS

It's a bit presumptuous to list ourselves as editors of this report. We do that only to establish accountability for whatever errors and inconveniences encountered by the agencies and individuals who participated in this undertaking. Whatever credit is due must be attributed to the conference participants. We have listed them in the Appendix.

The papers included here are much as they were when presented at the conference. Revisions, if any, were minor. Most of the discussion that took place was intentionally not recorded. We chose not to include in the report the portions that were recorded. The print media seems too cool to capture the tone, or even the essence, of the discussion. Extensive editing seems to warp the context, and suggests formality neither obtained nor desired.

We wish to acknowledge the contributions of many others who made the conference and this report possible. They are: Marv Beatty, Ione Brown, and Ernest Ehrbar, all of University Extension and to Greg Hedden, Director of Advisory Services, University of Wisconsin Sea Grant Program, for their active support of the entire program; Mrs. Evelyn Farrell for handling many of the conference details including conference registration; Mesdames Jean Brien, Joy Phillips and Hope Mercier, our secretaries, for translating unintelligible and badly-rushed notes and requests into whatever orderliness was obtained. Mrs. Phillips typed the final copy of the entire report. Linda Weimer of the Sea Grant Program pushed the report through production in record time.

The conference and report belong to these people and to those who participated in the proceedings. We hope not to have done too much violence to their talents and goodwill since they are so important to our environment.

R.B.D.
T.L.G.

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The Impact of the National Environmental Policy Act

NEPA: BUCKLE DOWN OR BUCKLE UNDER?

Thomas L. Goodale
Associate Professor
University of Wisconsin-Green Bay

Dr. S. Dillon Ripley of the Smithsonian Institution, in opening his testimony to the Senate's Interior and Insular Affairs Committee said:

> "Mr. Chairman, I'm greatly honored to be here and to be able to open my mouth in this fascinating colloquium on the environment, and assumedly environmental quality, and I think that the joint committee shows prescient intuition in having these hearings in a room which is singly devoid of environment and which resembles to me an Egyptian sarcophagus."

Without being at all apologetic about our conference arrangements, the comment has rather wide-ranging applicability. Dr. Ripley is commenting on our insensitivity to our daily environment and our tolerance of environmental insults unthinkingly imposed on one another. We have, by his criteria, a long, long way to go if environmental quality is to be more than verbiage.

Concern for environmental quality is at least as old as Christianity. Concerns expressed in the Bible have been expressed almost continually for hundreds of years. Unfortunately, however, the expressions have seldom been more than verbal. The spirit of the National Environmental Policy Act of 1970 is to translate those concerns into something more tangible than assurances that everything's fine. Clearly, everything is not fine; a realization that we have come upon late, but surely not too late. Until recent times, the costs of environmental misuse grew very gradually, but were accumulative. Until recently, it seemed possible to defer payment. Until recently, the right to damage and degrade the environment was widely accepted and thus widely practiced. But the hour when lavish coaches turn to pumpkins comes to everyone.

Fittingly, President Nixon made signing NEPA his first official act of this decade. The act is something of a legislative landmark, but like all such landmarks, it is also something of an indictment. It is an indictment of our inability to change our ways of thinking and acting in a world confronted with drastic change in every other respect. We have been, and to a disheartening degree continue to be, as economist John Galbraith put it:

> ". . . guided in part by ideas that are relevant to another world, and as a result we do many things that are unnecessary, some that are unwise, and a few that are insane." [1]

We have been guided, for example, by the Judeo-Christian concept of man as a very special act of creation; as a creature outside of and superior to nature; as the master and subdoer of the earth. So the emphasis has been and continues to be on mastery, not upon harmony though these approaches are not necessarily mutually exclusive.

We have been guided by the economic dogma that the common good emerges from the competitive struggle of private interests. The public interest has been neither expressed nor clarified and agreed upon. Consequently, the nation's wealth, which is to say its human and natural resources, has been converted into money at a time when environmental conditions may become so degraded as to render wealth meaningless and which no amount of money can cure.

We have been guided by the belief that our democracy is the best form of government ever devised; a belief that is true, but also self-defeating when citizens become so satisfied in the faith that they ignore the practice. (Religious, as well as government institutions, have this inherent problem.) Democracy presupposes a citizenry which is informed and involved. That is starting to happen, although not always in that order.

We have been guided by a time perspective so narrow and so present oriented that nearly every individual and agency is on a go now, pay later basis. Our environmental debt is enormous and payments are falling due. And if population experts have taught us anything, they have taught us to think future, and practice a little self-restraint in the present.

We have been guided by unreserved faith that all questions are answerable; all problems solvable; all tasks completable if we can only break them down into their most minute parts. But our analysis has not been accompanied by synthesis; the parts are not made whole again, and in fact the whole has become both greater than and different from the sum of its parts.

These ideas, and the habits and acts based on them have been challenged by events over the last decade or two. Time has a way of turning virtues into vices and our few decades appears to be a time of such transitions.

The National Environmental Policy Act, in its way, challenges these ideas which have guided us for the last few centuries. It asks that we relate harmoniously to our natural environment; it asks how human and natural resources will be influenced by our acts; it asks that the citizenry be more effectively informed and involved in the affairs of government; it asks for thinking well into the future; it asks that our specialized knowledges be brought together into a meaningful whole. That is the revolution about which Mr. Train and countless others speak.

We are not very well prepared for all this. But that is what this conference is about and why all of us are here. During these two days we will learn more about the National Environmental Policy Act, its implementation, what two years of experience has taught us, some of the problems encountered, and how to better measure and understand the impact of our activities on the environment, and ultimately on ourselves.

Environmental impact analysis is, to date, an inexact process based in ecology, to date, an inexact science. Cybernetics, systems analysis, telemetry, photogrametry, electronic and satellite surveillance, remote sensing and other promising tools may make it the most exact of sciences. All of which will still not assure environmental quality. It will only give us better data to aid in decisions. We will still have to decide what it is we want, and what we are willing to give up or tolerate to have it.

In the final synthesis, if it is ethical to value one's chances for survival, to respect the value others place on their lives, to want the best for one's self without prejudicing the opportunities of others, and to hope for a decent life for one's descendents and long duration for the species, then the foundation of environmental policy is ethics. These two days will be devoted to demonstrating the wisdom of new environmental ethics and policies. We will demonstrate it first to ourselves, if necessary--and then, hopefully, to everyone else.

---

[1] John Kenneth Galbraith, The Affluent Society. New York, Houghton Mifflin Company, 1957, p. 3.

THE MAKING OF ENVIRONMENTAL POLICY: THE FIRST TWO YEARS

John Steinhart
Associate Director
Marine Studies Center
University of Wisconsin-Madison

I am going to try and take a somewhat larger view than those of you who have been working directly with Environmental Impact Statements. That's easy for me because I don't work directly with them and haven't had the pains and difficulties that we've heard about this morning. I want to try and look at how we got this particular piece of legislation and some of the surrounding legislation. I've included a timetable of the legislation at the end of this paper. We tend to think the Federal government doesn't work very fast. That's true in a number of contexts, but in this particular case a lot happened very fast.

John Maynard Keynes said one time that the ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Then he goes on to say that practical men who envision themselves as concerned only with the daily affairs of everyday life are in fact captives of some academic scribbler, usually of a good long time ago. Right now, those who believe in free enterprise and the commonly held notions of American business are captives of the ideas of Adam Smith and Ricardo. Keynes goes on to say that even madmen who imagine themselves subject to voices they hear in the air or visions they have in the night are in fact mostly subscribing to some academic scribbler.

We had, in the decade of the 1960's, the beginnings of an enormous amount of conservation-environment legislation. What's more, we had a collection of writings that came to some considerable prominence. The first, and by all odds the most famous was Rachel Carson with her book Silent Spring, hotly debated even to this day in certain parts of the academic community. These ideas and this legislation had much the same effect as the civil rights experience had perhaps five years earlier. That is to say, the expectations and the interest rose enormously. This is a prescription for political popularity, as it always has been in this country. Stewart Udall pronounced the 1960's as the greatest decade for environmental legislation since 1910. Now, since he played the role he did, that may be a bit overstated, but I don't think much. We added more park lands, for instance, in the U.S. in the decade of the 1960's than we had in the previous 30 years.

We had other things happen, of course, in the middle of the 1960's. One was the Civil Rights Movement and the events which culminated in the legislation of '63, '64, and '65. Events, then, began to turn in strange ways, ways that I think the people engaged in civil rights activity had not anticipated. The rise of Black Power, for instance, and the alienation of leaders, both political and intellectual, from the Civil Rights Movement was not expected. Student activism, whatever its origins, certainly dislocated the academic community far more than it had been dislocated any time since World War II. This meant that new ideas were at least under active discussion. I have to say, in all honesty, that the changes have not been as dramatic as some people might have hoped. UW-Green Bay is perhaps one of the most vigorous experiments undertaken in academia and they're few and far between believe me. The Vietnamese war at this time escalated interest in our domestic policies because it was one of the first real times that we have experienced the practical application of the foreign policy we have been embracing since World War II. Intervening in the affairs of other nations, whether we were right or wrong, produced results different than we had hoped, and exporting our ideas worldwide was not something that was welcome on the other end. Out of this came the general concern about the environment. It rose quickly as a national issue among the sort of ordinary people who thought not much about it, didn't read Rachel Carson, or for that matter, much of anything in the way of books, so let me pick it up at the beginning of the Nixon Administration.

Remember there are two struggles going on here in the Federal Government, that have been going on for at least the past 20 years.

The first of these is the struggle between the executive branch and the congressional branch. There's a substantial body of analysis purporting to explain what all that's about and how it came to pass, and who ought to win, or who is winning, or whatever. I don't propose to try to go into that at the moment, except to point out that every time new issues arise, one of the things that happens is the scramble for who is going to determine the direction the country will take, or the Federal Government will take. This struggle has been most prominent between the congress and the executive branch. It matters not whether they're the same party, as we know the same party is somewhat of an illusion. Mr. Nixon finds himself challenged from both right and left within the Republican Party and Lyndon Johnson certainly found himself challenged from both sides in the Democratic Party.

The second of these struggles is an invisible one, but one that goes on none the less. This is a struggle between a technocratic government and a democratic government, a struggle over whether or not the populace will participate in the choice and resolution of issues. There is a substantial push, and has been for many years, in the direction of making sure we have the appropriate experts advising on the technical issues of the day. Since almost all issues have important technical aspects associated with them, the result of this is an increasing isolation of the electorate from the process by which decisions are made. So that, for example, one sees, in the federal domain, the rise of the horizontal coordinating bodies that have no power--the regional commissions, the River Basic commissions, the shotgun weddings of local governmental units in an effort to get them to cooperate. Such commissions, although they are populated for the most part by well-intentioned men and, occasionally, by able men, are so remote from the electorate that the only boss to be satisfied is Washington or the State

Capital, as the case may be. For instance, the regional development commissions are charged with a particular kind of development and they have no official power, all they have is a carrot and a stick. The carrot is that if you do what we say you should do we will give you a grant. If you don't do what we say you should do we will pass some regulations. This struggle is becoming quite clear over environmental issues.

Once the environmental issue began to be prominent, the struggle began fairly quickly. The Nixon Administration, with the exception of Secretary Hickle, was inaugurated on January 20, 1969. On the 28th of January the Santa Barbara oil spill happened, easily one of the best publicized environmental affairs of the past several years. That plunged the administration much more immediately into environmental matters than they probably had anticipated. This is not to say it had not already become an issue, it certainly had. Russell Train, you may remember, the present head of The Council of Environmental Quality, headed a task force that met to make policy recommendations before the Nixon Administration came into office. There were a number of these task forces but the environment one headed by Russell Train came out with a good deal of strong language about the issues of survival, etc. It sounded like a distillation of the writings about the environment that had begun to become so prominent. The struggle between the executive branch and congress began promptly. It began first in the congress with the struggle among congressional committees for who was going to introduce legislation on this subject. In the Senate the most active members were Senator Nelson from Wisconsin, Senator Muskie on water pollution issues, and Senator Jackson on conservation matters. As you know, Congress operates strongly on the committee system, which determines whether legislation even gets considered, and, often, what gets passed. For example, two principal bills were introduced in this early period and there were a great many other bills. I counted 40 odd in the Senate at one point. There was Senator Jackson's bill that eventually became the National Environmental Policy Act; and Senator Muskie's bill, which in its original form was not too different from Jackson's bill, which eventually became the Environmental Policy Improvement Act of 1970 and set up the office of Environmental Quality.

In the House, affairs were, as they often are, still more like the Balkans, with committees upon committees all struggled for jurisdiction. One of the most active committees of the latter part of the Johnson Administration was the House Merchant Marine and Fisheries Committee. Edward Garmatz was chairman. It was Congressman Dingell, head of the subcommittee on Fish and Wildlife Conservation that introduced essentially the Jackson bill, (with Jackson's blessing as near as one can tell) as an Amendment to the 1946 Fish and Wildlife Act. That act has little to do with the subject matter of the National Environmental Policy Act, but was a device to make sure that it would be assigned to Dingell's subcommittee for hearings. It was so assigned and Congressman Aspinall's (chairman of the Interior and Insular Affairs Committee) nose was out of joint. Congressman Aspinall has hardly had a reputation as a conservationist. He comes from that school of thought in the West that says "If its there, we ought to exploit it, whatever it is." I think his constituents largely feel that way. There is much made of the frontier mentality. It exists and in some very clear-cut ways in large parts of the country. They see an opportunity for additional income in an area that is not very well endowed with opportunities to make additional income.

Congressman Reuss from Wisconsin has long been an activist in environmental affairs. Long being about five years for a congressman. Much pushing and shoving followed an extraneous event, the death of Congressman Dawson from Illinois which vacated the chairmanship of the Committee on Government Operations. This committee is the spearhead of the war with the executive branch, since among their charges is the authority to investigate everything that the executive branch does when they wish to do so. In the shuffle over who was going to take over that committee and how it was going to be reorganized, Congressman Reuss, being a relatively senior member of that committee, got a new subcommittee set up, a subcommittee on Conservation and Natural Resources, and got himself a charge in which it looks like they have jurisdiction over all environmental matters in the Congress. The last act of that battle hasn't been played yet. Congressman Aspinall has been around a long time and knows where the levers of power are and the skeletons are buried and is not going to give up his jurisdiction over environmental and conservation legislation easily. Whether or not Congressman Dingell is out of the picture is another matter because the precedent has been established, and precedent is equally important in our seniority and precedent governed Congress.

This is the kind of battle that goes on. Other matters which are peripheral to it frequently play a large role, so for example, Congressman Holifield, long the champion of atomic energy and chairman of the joint committee on atomic energy, bowed out of his position and took over Dawson's chairmanship on the Committee of Government Operations. Part of the reason for this was that he felt the executive branch was about to divide the Atomic Energy Commission into the Department of Natural Resources, and put the weapons programs into the Department of Defense. These changes sound to me like basically sensible ideas but clearly do not sound sensible to Congressman Holifield. Those things could be accomplished by an executive reorganization plan and it is the committee on Government Operations that says yeah or nay on reorganization. The actual reorganization that was made had to accept the political realities. If certain kinds of reorganizations which were recommended were made, they would have come afoul of Congressman Holifield's pet projects.

The bills were introduced, but the first licks were got in by the President. On March 29th, Executive Order No. 11472 set up the Environmental Quality Council, properly called at that time, the President's Environmental Quality Council, consisting of the President as chairman, the Vice-President as vice-chairman and I believe six of the cabinet members who were most concerned in environmental matters. This was a way of attempting to co-opt the leadership directly to the President. It didn't work. Jackson and Muskie were not enthusiastic about it and anyhow they were of the opposite political party so there wasn't even a necessity for a show of unity. It was clear as soon as it was done that that wasn't going to deflect the Congress. It meant that there was a certain amount of difficulty for people like Dr. DuBridge, the President's Science Advisor, trying to advise both sides to make sure that if we got a bill, it made some kind of sense and if we didn't get a bill, they must support the direction the President was going. That's a difficult game to play, because you can often get caught off base and then you wind up out of a job. Some people did wind up out of jobs.

The Jackson-Muskie fight was finally resolved with a truce negotiated as usual by the Committee staffs. Muskie's Water Pollution jurisdiction was not to be meddled with and his bill was to be allowed to go through and Jackson's bill was allowed to go on through, but the duplicated portions of the bills were eradicated by this truce. Muskie had really wanted a major office of environment quality on the model of the Office of Management and Budget. Jackson wanted something like the Council of Economic Advisors. It wound up by having a little of both, the Council of Environmental Quality, which we will come across in just a couple of minutes, and the Office of Environmental Quality which provides a supporting staff for the Council for Environmental Quality. It became a race then to see which bill would get passed first and here I think high marks for knowledge of Congressional machinery would have to go to Jackson. He managed to get his bill out and passed beforeMuskie was able to, so that the National Environmental Policy Act is essentially the Jackson Act.

Well, what does it say, and I'd like to take another look at it. We've heard about Section 102 so much that it's a little hard to realize there are other parts to this bill than Section 102. It's easy to recall Section 102 because for a great many of you in this room, it makes you do soemthing. The parts that don't immediately make you do anything are easier to overlook at the outset. It's a very strange bill in that the language in it is stronger than almost any bill that breaks new policy ground. It's easy to write a strong bill on a criminal matter for instance; much less easy when you are entering into a whole new policy area. The first section of the bill establishes a national policy. It claims to anyhow. It promotes anti-pollution efforts which would include Section 102 and it establishes the Council on Environmental Quality.

The first part, the national policy part, the basis and intent of the bill, contains some of this very strong language. For instance, it talks about problems such as population growth, urbanization, resource exploitation, and technological advance. First time in any legislation that I know of that technology is not looked upon as motherhood used to be before population concerns. Noting the critical importance of "restoring and maintaining environmental quality," the restoring part of it is a little unusual as language. It talks about using "all practicable means;" it talks about "preserving diversity and variety in individual choice;" it talks about the "balance between population and resource use;" it talks about "maximum retainable recycling;" it talks about the principle that each person should enjoy a healthful environment. All of these are essentially new kinds of policies and it remains to be seen what precisely will come out of all of this with some experience in both direct operation of the act and its litigation in court. There is only one loophole that I can see in that entire basis and intent section, and that is a phrase which reads "consistent with other essential considerations of national policy." That sounds like an escape clause for the Department of Defense for one, although I am sure that others may try and operate with it too, and it remains to be seen what will be interpreted as essential considerations of national policy. It's already clear in a practical sense what that means. It means, for instance, that when the economy turns down a little bit, the environment goes into second place and we go about trying to get the economy and employment back where it was before we do anything more about the environment. Whatever one thinks about it, that's not a new happening. That's been pretty much the case all along, whether it was with some other kind of social improvement legislation or something else.

Section 102 has been talked about. I would just like to make one or two comments about it, particularly things which have not yet, in my opinion, received the attention, particularly from the courts, that they are likely to receive eventually. You all know that it's strong in the sense that it takes the unusual position that the policies regulating public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this act. That is stronger language than usual, and it says that all agencies of the Federal Government shall develop methods and procedures to comply with subsection (C) which has the specific requirement for the impact statement. One part of the impact statement which has not yet received the attention that I suspect it will, talks about the relationship between local short-term uses and the maintenance and enhancement of long-term productivity. This is a very difficult issue that frequently arises over such matters as highway location and so on and I think we'll probably see more on that. Still more curious is the requirement in (C) (iii) for alternatives for proposed action. No one is clear yet what that means. In the case of highway offerings for instance, it appears that many highway planners conclude that one should offer an alternative in the location of highways. You know, do you want it here or there? That clearly doesn't exhaust the possibility for alternatives. The question is transportation and not the building of highways. Whether or not this section can be interpreted to require the consideration of alternatives more broadly than the specific operations and the specific jurisdiction of the agency in question is a matter which I am sure will come to court soon. There are a few comments in Judge Wright's decision in the Calvert Cliffs case that suggest that his interpretation may require much broader consideration of alternatives. If it does, the agencies, and all of you, will be in a still more difficult position. How, for instance, is the Atomic Energy Commission going to give adequate consideration to the alternative of solar energy generation, if they haven't been working on it because no one told them to.

It's my guess that unless something dramatic happens, that section of the Act is likely to be interpreted as asking for real alternatives. That's going to put the government in a very difficult position and the people in operating agencies in an especially difficult position. The alternative, for instance, to the Corps of Engineers Erosion Control Programs might be to let it happen. Well, now that's a real alternative. The Corps of Engineers can't exactly do that at present.

Another item in this bill which seems to me to be extraordinarily strong, is the requirement for intergovernmental cooperation. They don't suggest consulting with other agencies. It's a specific requirement and the responses of the agencies, if any, are to be added to the dossier on the particular project in question and made available to the public. That's normally not been the case. It is true under the Moss Freedom of Information Act that any official document presumably is available. Ralph Nader has made quite a career out of trying to route these documents out of their relevant agencies. But there are many ways that can be prevented from happening. The Office of Science and Technology, for instance, in many of its internal papers as a matter of course stamps them "Rough Draft, Not For Official Use." That doesn't classify them. That just means that if somebody comes looking for a document, there isn't any such document, because it has never been acted on, never been anything other than a rough draft. I don't know whether this is encouraging or discouraging about our Federal Government, but it's the way it has operated within my memory.

The Act continues strongly. Let me just read subsection (D). "Study, develop and describe--Study, develop and describe--appropriate alternatives for recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." What's an unresolved conflict? All we have to do is file a lawsuit and there is an unresolved conflict, so that almost any project that anyone has any interest in whatever can be turned into an unresolved conflict. What does it mean to develop alternatives? Well, I don't know but that's a very curious part of the language.

The last strong part of it hasn't received much attention yet this morning -- Section 103 of the Act which calls for the present policy reviews. It effectively says, This Act, and now I'm interpreting very liberally; This Act supercedes all other Acts and Administrative Procedures except where there is specific legislative language to the contrary. What the Act says is that all other activities will be brought into accord with the provisions of this Act. It requires that an Agency review administrative regulations, current policies, statutory authority, and so on, and recommend to the President such measures as may be necessary to bring their authorities and policies into conformity with the intents, purposes and procedures set forth in this Act. That's a rare item in legislation in which they simply say, straighten out everything so it's in agreement with this one. If, in fact, you tried to do that--tried to make present jurisdictional matters entirely consistent from agency to agency--the government would never accomplish anything.

The Act also set up the Council for Environmental Quality. Briefly what is that? It is similar to the Council on Economic Advisors in its structure; a three-man council. The chairman is level two executive appointee. That's important in terms of the act. It gives some idea of the importance attached to this position. That is a position that is equivalent in stature to the President's Science Advisor, and to the Chairman of the Council of Economic Advisors. It's the same level as the Undersecretary of a department. That's about the level of importance that's attached to it. The other two are level four executives.

Their duties were to advise the President, and to review agency work. They can do advising alright, that's the whole nature of the Executive

Office of the President, lots of advice. The President needs it. He's got lots of problems. Review agency work--that's a good deal more difficult, but it can be done from the Executive Office of the President. The Council of Economic Advisors and the Office of Science and Technology and a few others of the Executive Office of the President agencies have sometimes been effective in reviewing agency policies. The third thing the Council on Environmental Quality is to do is to conduct investigations. That it cannot do and probably should not do in the Executive Office of the President. Congress seems to be a little dim on the operation of the executive branch sometimes and not very clear on how it actually works. That duty was later assigned by an executive reorganization plan to Environmental Protection Agency, and we will get to that in just a couple minutes. They are to report to the President and the agencies are directed to help. An annual report is required of the President with the help of the Council on Environmental Quality on the state of the environment. That annual report, by the way, seems to have appealed to Jackson and his supporters in terms similar to the impact that the annual report of the Council of Economic Advisors has had in the past ten or twenty years. Whether it will have the same impact is not quite so clear because the state of the economy has turned out to be considerably more important politically than the state of the environment. We'll see whether that changes but right at the moment, I would guess not, because when people are out of work, they seem willing to scrap the environment. The Council on Environmental Quality is required to consult with the Citizens Committee on the Environment. Executive Order No. 11472, early in 1969, changed what had been the Citizens Committee on Recreation and Natural Beauty, headed by Lawrence Rockefeller and consisting of the usual collection of mostly wealthy and well-meaning, public-spirited people, to the Citizens Advisory Committee on Environmental Policies. Such committees have marginal utility in my opinion. It may be a useful device to communicate back and forth between some important and wealthy leaders of society, but on the whole they are pretty much useless as far as doing anything is concerned.

The Act also contains money, and money is where its at in the Federal Government. It contained authorizations for $300,000 for the first year, $700,000 for the second year and $1,000,000 thereafter. That's maximum authorization for budget. The Appropriations Committee invariably appropriates less than the authorization. $300,000 is just not very much money. You take three executive level employees and equip them with a couple of secretaries and one guy who isn't too proud to actually do some work and you've used up your $300,000. The salary of an executive level two is about $48,000 and executives of level four get about $42,000 annually. Add a secretary or two, an administrative officer and maybe a staff director though there isn't any staff and you've had it. The money's gone. The point I'm trying to make here is that this bill did not equip the Council of Environmental Quality to do any more than exist. They could no more discharge the duties entailed in the Act than they could have flown to the moon. It depended upon the Muskie Bill getting passed later.

The present makeup and still the original appointees are known to most of you. Russell Train, long head of the Conservation Foundation and Undersecretary of Interior in the new administration when it was first formed, was named chairman. He's too nice a guy for most government jobs. He tends to be rather gentlemanly in an administration not noted for gentlemanly conduct. In the Department of the Interior for instance, and I don't mean this as any particular disrespect to Russell Train who is a man I admire very much--he just couldn't play the game with Walter Hickle above him and Carl "Cleanwater" Klein below him. They play mean and they play dirty if they think they are headed in the right direction. The other two members are Bob Kahn, a Pulitzer Prize winning writer of the Christian Science Monitor, and Gordon McDonald who is a rather interesting fellow. He had been vice-president of the Institute of Defense Analysis up until two years ago. He's very clearly one of the younger members of the what has come to be called, in the scientific establishment, the cold-warrior crowd, very much addicted to the rather arrogant notion that many physical scientists have; that with a little common sense they could solve all the problems and then get back to solving the physics of the world. I think that's a mistake in makeup. In my opinion there should either be all scientists or no scientists on the Council of Environmental Quality. They have a problem in that McDonald is in a position to be the expert among the fishwives with technical matters that are under discussion. That's a dangerous position to have anyone in, no matter how well intentioned he is. What is probably more disturbing is that on the Council of Environmental Quality, or even among the staff leaders, we have not found the men who have been actively working on environmental problems for the last ten or twenty or thirty years. They are for most part recent converts. They announced their faith in the environment quite recently and then became experts. I am one of those in case any one is in doubt and I'm fairly clear on how limited your perspective can be if you arrive via that route.

Let's just go on through this timetable for a moment or two. The President tried to establish his primacy in this area with his Executive Order No. 11472, setting up the President's Environmental Quality Council. On July 10th, the House killed it. The money to support that council was in the Interior Appropriations Bill last year and they knocked it out. That was the kiss of the death for the President's Council as a principle coordinating mechanism. I think it's probably correct that the President did not retain authority in that presidential body. The reason is that no council or committee headed by the President can comment on anything. The President after all, as Harry Truman once remarked, is "The place where the buck stops." The President cannot comment and say what we ought to do because if we ought to do it, then, why doesn't he do it. That's the point. The Council on Environmental Quality, even though they are located in the Executive Office of the President, may make a great many comments because they are not the President. So that early committee appeared to the public as though they were not considering the important issues. I sat in on a number of their early meetings. They were considering the important issues, but if they weren't prepared to act, they had to keep still, and that's the difficulty with that kind of arrangement.

Things went right on. July 18th the President sent a special message to the Congress on the population problem. Unprecedented! Really. Eisenhower had just barely summoned up the guts to mention it one time and here's a whole message on it as a problem. August 22nd was a sort of major step. For the first time the Department of the Interior, largely at Walter Hickle's instigation, really put the clamps on drilling regulations and control of off-shore drilling regulations in opposition to the oil industry in part. That is to say, the oil industry had a good healthy input into it, and probably more influence than some people would like, but for the first time in my memory, the executive branch of government went against the oil lobby and don't think the President didn't hear about it, too. That's the most powerful lobby in Washington.

In September, the Congress set up the Environmental Policy Division of the Legislative Reference Bureau. The only real source of expertise in Congress for routine matters under discussion, unless they want to put a man personally on their staff as technical expert, is the Legislative Reference Bureau of the Library of Congress. They set up their own Environmental Policy Division with Dr. Richard Carpenter as head. That represented a big step with them.

November 4th, the General Accounting Office reported on Water Pollution, a report that had been underway for over a year, and it was highly critical. The General Accounting Office has maintained an enviable reputation, I think, as a relatively unbiased observer of what's going on within the government, particularly in the executive branch, since they are a creature of the Congress. It was highly critical of water pollution efforts and programs administered by the Federal Government. Partly in response to that report, we had a number of curious affairs. I happened to have picked out only two. On November 25th, just a couple weeks after that, the Congress went against the President's budget, and increased Air Pollution Research by a factor of three. I think the budget called for 12 million and they put up 47 million. On December 4th, they even went more dramatically at it. Of a total one billion authorization for a whole variety of water programs, the administration had asked for $216,000,000, the Senate gave them the whole billion dollars, and the House gave them $600,000,000. Both houses were way above the requested budgetary figures and it was settled in committee at $800,000,000 so the administration got three times what it had asked for, for water pollution. This was again part of this war between Congress and the executive branch as to who is going to decide what the programs and the extent of those programs are.

On January 1st, the National Environmental Policy Act of 1970 was signed into law. January 22nd, the State of the Union message was delivered in which the President talked about "the most comprehensive and costly program in history," and offered up 10 billion dollars worth of environmental programs. Ten billion, that's large even by Defense Department standards. February 4th, he followed that up with Executive Order No. 11507 which puts very strong strictures on federal facilities to comply with a whole lot of environmental policy, in particular, of course, things established by the National Environmental Policy Act. On February 10th, having cleaned up that little matter about facilities directly under government control, we got the President's environment message. Again, very strong language. He talks about "total mobilization" for environmental matters. There are some 37 proposals in that Congressional message, of which at least 20 represent new programs. The others are programs collected from here and there that have been going on anyhow.

In some cases they are expanded, but mostly not. March 5th, Executive Order No. 11514 was issued. It is a set of directives to the Council of Environmental Quality and agencies expanding the details available for the implementation for the National Environmental Policy Act. I suspect, although I am not sure, that that order was largely drafted within the Council for Environmental Quality. April 3rd, the Environmental Quality Improvement Act of 1970 was passed and that one, the Muskie Bill that had been sort of racing with the Jackson Bill somewhat unsuccessfully, also has a policy statement. By now it appears to be a shorter and somewhat diluted version of that in the Jackson Bill. It sets up the Office of Environmental Quality with the chairman of the Council of Environmental Quality as director of the Office of Environmental Quality and, in short, provides a staff for the Council of Environmental Quality to execute both its responsibilities under NEPA and the additional responsibilities laid out by this Act. April 22nd, just by way of reference, was Earth Day, in some ways the public press high water mark of this whole episode. Two things happened in May that are kind of interesting that is peripheral to these matters. One was James Allen got fired, largely because of his statements about the war and the environment. Secretary of Interior Hickle wrote the famous letter about young people which was leaked to the press. I have a strong suspicion that it was leaked quite on purpose. Most of them are. In November, he was fired. In terms of the reorganization which I'd like to talk about in just a moment, Hickle was the loser and losers often resign for personal reasons or what not. Walter Hickle is a strange man. They would have to fire him if they were going to get rid of him and they did of course. We're nearly to the end of the era I want to cover. July 9th was the last part of it. Executive reorganization plans 3 and 4 were submitted. Plan 3 was the one that set up the Environmental Protection Agency and just in case anyone is not clear, EPA was not set up by an act of Congress. It was set up by a reorganization plan of the President, which under present law, goes to the Congress. If they do not act on it within 60 days, then, it becomes law. Reorganization plan 4 set up the National Oceanic and Atmospheric Agency. This resolved the dispute which had been going on since about 1968 and is relevant to the environment and, in fact, was part of the whole battle over reorganization which wound up with having EPA and NOAA, with NOAA in the Department of Commerce and with the Department of the Interior on the whole losing out in this affair. That is, as power and jurisdiction are normally measured, Interior lost, Commerce gained. We have a new agency. I think that's a fair way to state it. Some of the other agencies lost a little bit but for the most part, they didn't care.

Just one more comment about the Muskie Bill. The money finally begins to sound like enough money to do something within the Executive Office of the President. It starts out with $500,000 the first year and goes up to a million and a half by the fourth year. This means that about next year the authorizations will be well up over two million dollars which is enough to do a pretty decent job with an office of the kind that CEQ is supposed to have. One other effort of Muskie's here ought to be taken note of. The Environmental Quality Improvement Act of 1970 takes note of the environmental quality annual report, required to be furnished by the President with the assistance of CEQ and everybody else, and requires that it be referred to those Congressional committees having jurisdiction over the particular subject matter. Now this is Muskie's way of saying, No, Jackson, you can't have it all. I demand my piece. This was supported in the House as well. What's happened here is a working out of some of the Congressional jurisdictional questions.

Let's take a quick look at the reorganization and what it amounted to. Government reorganization is taken seriously by almost every new administration that comes in and is often abandoned in confusion and distaste a couple of years later. You can think of the Commissions that have long since gone by the board from the Hoover Commission onward. A few things get done. You may remember when Nixon came into office, Bud Wilkinson, who seemed to be successful at organizing football teams, was given the job of abolishing useless federal agencies. Right? It's now two and one half years later. So far as I have been able to determine, he has almost succeeded in ending the official existence of the Upper Potomac Battlefield Monument Commission and nothing else. Now don't laugh at Bud Wilkinson. I'd like to see anybody try and disestablish a long-standing federal agency. It's almost impossible. It's the one place in this world where immortality seems to be guaranteed instantaneously Nevertheless, there was a high level reorganization group set up, headed by Roy Ash, the president of Litton Industries, to recommend major government reorganizations. Many of you know of Nixon's message on reorganization last year, and the whole suggestion sounded pretty good. It talked about, for instance, for our purposes, a Department of Natural Resources. These were real recommendations of the Ash Council. There was one fly in the ointment and his name was Maurice Stans, the Secretary of Commerce. A very strange man. You may remember he was budget director in the latter Eisenhower years and he's a tough cookie. He knows a great deal about how the government works and he takes seriously his charge as Secretary of Commerce to promote business and industry in the United States. I think he does this with good intention, although it may make him my mortal enemy because at times it pushes us in directions that I think are undesirable to go. The Ash Council had recommended that the National Oceanic and Atmospheric Agency be set up within the Department of the Interior and that most of the environmental activities be centered in the Department of the Interior. Losing the Environmental Science Services Administration from Commerce would take away, what was it, 40% of their personnel, and about a third of their budget and what it left was a collection of medieval guilds that didn't look much like a department of anything. I remember the very specific day that Roy Ash went to have lunch with Maurice Stans to break the news to him that the President intended to tentatively approve that plan. The following day I say Roy Ash and his chief staff man and they looked kind of glum and it seemed the President had changed his mind, or Maurice Stans had changed his mind, or something had happened, because at that point it was decided that NOAA was going to go into Commerce. Secretary Hickle fought this vigorously as I understand. In the end, Hickle simply lost his credibility and his influence in the White House and eventually was fired.

Walter Hickle was one of those rare items in Washington. A man with a lot of guts who has no hesitation in charging into the bureaucratic swamp for the absurdly simple reason that he thinks he's right. It's rarely done, after all.

What we wind up with in any case is NOAA as the kind of sop to the aerospace industry largely, the supporters of this kind of marine activity. It became obvious that there was no magic alchemy to be had from the oceans, no magic food for the millions, and no magic sources of platinum, diamonds, and gold lying around the bottom of the ocean. What there was, the National Securities Industrial Association felt, was some employment for the industries that were being increasingly displaced by a shrinking defense budget. It was no accident that the most vigorous supporters of those bills were the same people who were in the exploratory submarine business, the underwater habitat business, and all the kinds of hardware uses of the ocean that have become rather prominent. The sop went to Congress with NOAA and reorganization plan 4 let them promote the oceans as a relief measure--a social relief measure for unemployed aerospace capacities. The rest of that program is, I think, a fairly honest attempt to both utilize ocean resources and to exercise some understanding of the oceanic environment before we wreck that too.

EPA wound up as an independent agency because the Interior arguments lost out altogether and because there are some arguments for making an independent agency out of EPA. HEW was unenthusiastic about seeing some substantial hunks of their activity get transferred to Interior, but much less paranoid about having them set up as part of an independent agency. EPA is a patchwork quilt initially, and this patchwork quilt, in case anyone has forgotten, is made up of the Federal Water Quality Administration, formerly the FWPCA from Interior; a group of smaller pesticide programs which came from Interior, HEW, and Agriculture; the National Air Pollution Control Administration from HEW; the Solid Waste, Water Hygiene and Radiology Programs from HEW; the Federal Radiation Council which had been appendage within the Executive Office of the President; and some AEC regulatory functions. More of AEC's regulatory and standard functions were recommended for transfer to this new environment group, but that was before Congressman Holifield moved to the Government Operations Committee. Once he moved, negotiations were taken on directly from Bruce Harlow's office in the White House to see what Holifield would permit being transferred. What he would stand still for being transferred was transferred. In particular, general population radiation standards. He would not accept the transfer of the standard setting functions for the nuclear plants themselves. That still technically remains within the AEC. EPA also wound up with the general ecological research function, transferred from the Council of Environmental Quality which was where it never really belonged.

NOAA, was also a patchwork; the Environmental Science Services Administration, which really is the weather bureau, and the Coast and Geodetic Survey were already within Commerce; Bureau of Commercial Fisheries and Marine Sport Fisheries from Interior; Marine Minerals Program from Interior; the Sea Grant Office from the National Science Foundation; and the Lake Survey from the Army. Taking anything from the Army Corps of Engineers and putting it anywhere else is almost out of the question. The Public Works Committee of Congress has been a pork barrel for as long as anyone can remember, and even the Corps of Engineers people get very embarrassed about it from time to time. The National Oceanic Instrumentation Center and the National Oceanographic Data Center, both from the Navy got transferred to NOAA. The Navy had been trying to get rid of them for years anyhow. The Data Buoy Program was transferred from the Coast Guard which resisted rather vigorously because it was really the Coast Guard's only active research program of any real merit. It's too bad to see the Coast Guard out of any kind of environmental research activities since they are one of the principal forces as far as the marine area is concerned. EPA and NOAA don't really overlap except in this whole area of environmental protection and it's not clear how that's going to shake down. It depends to some extent on leadership. Ruckelshaus was brought over from the Department of Justice to be head of EPA. I would say he's an experienced government official, though by no means in my opinion, a match for Bob White, the long time administrator of ESSA or especially for Maurice Stans, but we shall see how this comes out. Maurice Stans, you may have noted recently, made some statements about how we mustn't now go overboard on the environment, it's bad for business. I'm interpreting a little bit liberally, but that's sort of the attitude he's taking and yes, indeed, some of the things are bad for business. If a concern can't clean up the wastes that they are putting out, they're likely to go out of business and the people who are employed there may be unhappy.

What has all this added up to in program? The funding of 1969, and these are obligations, was 916 million for environmental programs, 1.29 billion in 1970, and 4.8 billion in 1971. That's an increase of almost a factor of 6 in 2 years, that far exceeds even the NASA program's enormous expansion in the early 1960's. Of these numbers, say in 1970, about half are state and local assistance programs for things like sewage treatment programs, about a fourth of that total is research and at least the beginning stages of development. That's about where we stand.

What seems to me to be a fundamental issue lying in back of all this is one I brought up earlier, this underlying question of whether we are going to go in the technocratic direction, or in the democratic direction. I think the scientific community, or at least some of its most vocal parts, have been urging us very strongly to go in a technocratic direction. Let's get the experts and get the facts straight and then do it. That idea implies that we know what it is we want to do and reeks very strongly of the cold war notion of what we must do to those people to straighten out their problems. In this case those people are not some poor underdeveloped nation of the world, those people are us. Somehow I find the present state of affairs more encouraging because with the present court decisions and the language of the National Environmental Protection Act, the opportunity is there to convert environmental matters back into a political issue among the electorate. What is it we wish to do? How seriously do we wish to consider environmental damage? How seriously and how widely range the alternatives we wish for development? How much diversity do we wish to have and tolerate? None of these are questions which are resolvable by technical experts or by systems analysis. Once we have resolved those kinds of questions, and we may well do it in the next two or three elections, then, it becomes possible to summon up technical experts and say, what we have decided to do is this, now how do we do it? In that case, most of us who have some technical expertise of some kind or other can yield up some answers that are probably reasonably factual in pursuit of a clear cut goal.

Notice what's happening here, the government really is moving fast. We've had something happen once a month or twice a month for two years, in a new programatic area. At the same time we're fighting a war, we're having riots on the campuses, and riots in the cities. At the end, we had an economic downturn which is why things kind of peter out. The environment took second place to the economic difficulties, I'm afraid. That certainly seems to be what happened this year. One final comment. I don't think the present organization is as good as it should be, and I have made a goat of Maurice Stans. He deserves it in some respects. On the whole it's not as bad as it could have been. It could have been a lot worse and what's more, the way we organize to do things, has to be considered carefully. We're talking about the environment here. The government's problem is that you can organize only one way at a time, but unfortunately, you can organize a better way to deal with almost any problem you can think of. The problems continue to increase both in number and in intensity in recent years, but we are still limited to one organization, that is, one overall government organization. The present court cases, the language of the Act, the availability of environment information much more widely through the environmental impact statements, seem to me to be a democratic direction that comes somewhere near the rather tarnished dream of a participatory government. If we can move in that direction, I think we may stand a chance of getting ourselves out of our difficulties, or at least going in the direction we are going intentionally, something I think we have not been doing very often in recent years.

Q. "Do you feel that during the Nixon Administration the reorganization is over?"

A. No, I don't think so. Let me answer that in two ways. I think that the major reorganizations have probably already happened, but I also think that there will be continued pressure toward some of the major features of the Ash reorganization plan. I would not be surprised to see some effort toward converting the Department of the Interior to a Department of Natural Resources with a good deal of resource development activity within it. Whether that can be done, while Stans is Secretary of Commerce I don't know. Whether the Environmental Protection Agency might then become part of this reorganized Department of Natural Resources, I don't know. Such a course was recommended by the Ash Council as a next best alternative before they disbanded. I don't know whether any attention will be paid to that or not. It would make a lot of sense as far as I am concerned. A free standing agency has a lot of difficulty when the going gets rough. Right now EPA has a reasonable, although not very closely connected, constituency in the public. That situation could change and you then have difficulties like the National Science Foundation has frequently had. I would suspect it would be better to have a Department of Natural Resources with some major units of which EPA might be one.

Q. "Will the backlash typified by some of Maurice Stans' statements gut the environmental interest among people?"

A. I find that hard to predict. No, I don't think so. In some local issues, the automobile highway issues, for instance, no amount of papering over is going to change feelings so long as automobile sales grow at a rate which permit the economy to expand as everyone expects. By the end of the century such growth will have reached absurdity. That has to change, and one way or another, we're going to have to deal with issues of that kind. Our present way of operating depends upon our automobile sales remaining above six million cars per year. By 1980, it looks as though growth elsewhere in the economy would require that figure to be up closer to nine million cars per year. Something like twenty per cent of the labor force of the United States, directly or indirectly, is involved with the automobile industry. That must change before the turn of the century, which isn't all that far off. Most of us are likely to still be around. We simply cannot tolerate either the air pollution or that much machinery around. There isn't any obvious way to deal with the auto problem, so I don't think it's going to go away. In some areas, the enormous concern about rather small effects may diminish a good deal. A slight change in popular opinion might emphasize other social programs--for instance, in the city--in which environment will take second place, and we put out a little more air pollution. Well, you put another black box in your chimney. I think it would be a mistake to do that, but I think it may happen.

Q. "What is your opinion of Muskie's current bill on recycling and zero discharge?"

A. That puzzles me. The zero discharge notion is, of course, errant nonsense. You are going to discharge something, no matter what we do, unless we elect to suddenly stop engaging in any kind of industrial enterprise whatever. I really don't know what the intention is behind that bill. The zero discharge part appears to me to be just absurd. That's as bad as the Indiana legislature which, some years ago, almost passed a bill setting pi equal to 3. You can pass the bill but it won't happen. I wonder if that bill of Muskie's might have been partly a device to be useful during his campaign. Congressman Harley Staggers has been introducing a bill to prevent all weather modification every session for the last eight sessions of Congress. He introduces it about three weeks before Congress adjourns, and then goes home and campaigns on the issue. A lot of the people in West Virginia are persuaded that the government is modifying their weather.

Supplement I

FEDERAL ENVIRONMENTAL
TIMETABLE

1969

January 20 - Inauguration

January 28 - Santa Barbara Oil Spill

May 29 - Executive Order 11472 Environmental Quality Council and Citizen's Committee established

July 10 - House Appropriations Committee. Billed funds for Environmental Quality Council

July 18 - President's message on population

August 22 - New Hickel rules on offshore oil and gas

September - Environmental Policy Division in Legislative Reference Bureau of Library of Congress established

November 4 - General Accounting Office report on water pollution

November 25 - Congress increases air pollution research 18 million to 45 million

December 4 - Public Works appropriation waste treatment request 214 million 800 million appropriation - authorization 1 billion

1970

January 1 - PL 91-190 - National Environmental Policy Act signed

January 22 - State of the Union message - "most comprehensive and costly program in history" 10 billion

February 4 - Executive Order 11507 for Abatement of Pollution of Federal Facilities

February 10 - President's Environmental Message - "total mobilization" for environment - 37 proposals

March 5 - Executive Order 11514 - Agency & Council on Environmental Quality responsibilities defined in detail

April 3 - PL 91-224 - Environmental Quality Improvement Act of 1970 - Office of Environmental Quality established

April 22 - Earth Day

July 9 - Executive Reorganization Plans 3 & 4: 3 - Environmental Protection Agency; 4 - National Oceanic and Atmospheric Administration

Fall - Economic downturn

CEQ AND ITS ROLE IN ENVIRONMENTAL POLICY

Thomas C. Winter
Staff Member
Council on Environmental Quality
Washington, D.C.

Historically the Federal government, like many bureaucracies, has had trouble coordinating programs between its entities. As a result, most programs have been conceived so that they fall pretty much within the jurisdiction of one agency. Over a hundred years ago the Federal government decided to take a more active role in the field of agriculture. The Department of Agriculture was formed. Over a decade ago it was decided that this nation should vigorously participate in the exploration of space. The National Aeronautics and Space Administration was created to achieve this goal.

The Federal government's various environmental programs are not so easily placed within one agency. If one agency were created to encompass all programs effecting the environment, there would be very little left over for the other agencies to accomplish, since most Federal activities are affected in a major way by environmental considerations. A truly coordinated approach is required by all Federal agencies if we are to preserve and enhance our environment.

Congress set forth its strategy to achieve this coordination in the National Environmental Policy Act, referred to as NEPA, which was signed into law on New Year's Day of 1970 - the first law of the new decade. NEPA's basic purpose is to insure that Federal officials weigh environmental considerations along with the more familiar mission and economic considerations in policy formulation, decision making, and administrative actions. Few quarrel with this concept in theory, of course, and the words sound nice. But the challenge is to actually do this, in accordance with the spirit of the Act, in real life situations where resource limitations and other practical factors necessitate that trade-offs be made.

The basic mechanism to carry out the spirit of NEPA is the environmental impact statement. This mechanism mandates that Federal agencies implement the basic NEPA tenets of environmental considerations in Federal actions. It further provides that these implementation actions receive "goldfish bowl" type of visibility. Too often in the past there have been cases where the planning considerations in many agency actions were kept from the public and were not released until after the decisions had been made. At this late time it is extremely difficult for the informed public, particularly when they do not have the staff resources which the agencies do, to affect the decision.

An environmental impact statement is required from the prime Federal agency in all actions which have significant effect on the environment, regardless of whether any of its funds are involved. The law requires the statement to address the following points: the environmental impact of the proposed action, any adverse impacts which cannot be avoided by the action, the alternative courses of action, the relation between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and a description of the irreversible and irretrievable commitment of resources which would occur if the action were accomplished.

Interim implementing guidelines were issued by the Council on Environmental Quality shortly after the passage of the Act. Final guidelines were issued on April 23 of that year. These guidelines make it explicit that the draft environmental impact statement should be prepared as early as possible in the planning process. The intent is that as soon as a fair grasp of the problems involved is obtained, the draft will be prepared and circulated for comment. It is not necessary or even desirable to wait until after solutions have been worked out for these problems. It's better to get the input from the interested and informed public before solutions are worked out rather than afterwards. Further, the guidelines require, with few exceptions, that no agency administrative actions will occur for at least 90 days after the draft is circulated and for at least 30 days after the final statement is made public. To date the Council has received over 2,000 environmental impact statements.

When you get right down to it, NEPA is a piece of legislation with quite a broad mandate, just as is our Constitution. It could be interpreted in many ways, from merely a statement of philosophy with very little provision for actual implementation, to the establishment of a detailed procedure within the Federal government requiring considerable effort. The real test as to how it should be implemented has been taking place in the courts of law. In general, most of the court decisions have favored a rather strict interpretation of NEPA and implementation of its spirit. As one judge said when discussing the legality of its provisions within the framework of other Constitutional authorities, "NEPA goes right up to the brink, but it does not quite go over."

A significant case which has bearing on the environmental impact statement mechanism involved a nuclear power plant which is under construction on Chesapeake Bay in Maryland.[1] Here the plaintiffs challenged the basic ground rules of the Atomic Energy Commission in implementing the National Environmental Policy Act. AEC was involved, of course, since they must grant licenses to all nuclear power plants, both to construct them and to operate them. The judge in his opinion last July made the following points:

1. The environmental impact statement mechanism and other provisions of NEPA were effective on the date that the law was signed and not on the date, 15 months later when AEC established their machinery to actually implement the law.

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[1] Calvert Cliffs Coordinating Committee, Inc. v. AEC, No. 24, 839 (D.D.Cir. decided July 23, 1971).

2. AEC must consider all environmental issues and not just those, such as radiation, in which it has particular expertise.

3. AEC must evaluate all issues even if they have been previously certified by the Federal government or States as meeting the applicable standards.

4. AEC must look at the projects whose construction licenses were granted before the date of the Act if the operating licenses were not granted until after the date of the Act.

5. The AEC blanket policy to not halt the construction of existing power plants was wrong. Each plant should be considered on its own environmental merits, even if construction is underway.

In his opinion the judge commented that the court's duty is to see:

> "...that important legislative purposes, heralded in the halls of Congress, are not lost or misdirected in the vast hallways of the Federal bureaucracy."

The import of this decision is that the environmental impact statement mechanism is effective from the date of the Act and that it must be followed in spirit as well as in form.

In the early court cases involving NEPA the emphasis was on whether a statement should or should not be filed. A much publicized decision along this line concerned the haulroad connected with the Alaska pipeline. In the spring of 1970 a court issued an injunction against further construction until the provisions of NEPA and of the Mineral Leasing Act were complied with. One of the key issues underlying this decision was that an environmental impact statement had not been prepared.

More recently, the adequacy of consideration has been a significant point in suits involving the environmental impact statement mechanism. One such case concerned the construction of Gillham Dam across the Cossatot River in Arkansas.[2] This project was approved in 1958. Project construction began in 1963 and was about two-thirds complete at the time of the trial. The Corps of Engineers, the defendant, did issue an environmental impact statement. But the plaintiffs contended that:

> "...the impact statement simply does not set forth a detailed study and examination of the important environmental factors involved."

In the ruling the Court made the comment that the defendant must:

> "...utilize systematic and interdisciplinary approach using natural and social sciences and environmental design arts, include discussion of value of river

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[2] Gillham Dam Environmental Defense Fund v. Corps of Engineers, 325 F. Supp. 728, 749 (E.D. Ark. 1971).

> without the dam, include all environmental impacts of dam construction, explore all alternatives to dam construction, include all irreversible commitments of resources, and include comments of federal, state, and local agencies."

The important point here is that in this and similar cases the courts are insisting that the spirit of the law as laid down in NEPA be followed and that all options be considered. But - and this is significant - the courts are not attempting to substitute their judgements for those made by the agencies in the Executive branch.

Another provision of NEPA established the Council on Environmental Quality in the Executive Office of the President. The Council is primarily involved in the recommendation of plans and policy. A major portion of its work concerns the environmental legislative program, its formulation, passage, and implementation. Another important function of the Council is to insure that procedures to implement the environmental impact statement mechanism are established within the Federal government and are made to work in a manner which will insure that environmental considerations are given due weight along with the mission and economic considerations in Federal activities, with minimum administrative burden to the agencies. NEPA requires that one copy of each environmental impact statement be submitted to the Council. The President, in Executive Order 11514, March 5, 1970, further directed that the Council would:

> "issue guidelines to Federal agencies for the preparation of detailed statements on proposals for legislation and other Federal actions affecting the environment, as required by Section 102 (2) (C) of the Act."

I want to emphasize that our primary role is to see that the mechanism works and not, as is believed by many, to make a detailed evaluation of each statement. We simply do not have the expertise or the staff size required to evaluate each and every statement in a critical and objective manner.

There are several ways in which a statement can be evaluated. The first is within the agency which prepares it. I mentioned earlier the Council's guidelines (issued in the Federal Register, Volume 36, April 23, 1971, pp. 7724) which require that a draft statement be prepared as soon as possible in the planning process and be made available to the public. In the process of preparing the statement and evaluating the comments received on it, it is intended that a fair judgement will be made within the agency concerning the action and all the trade-offs involved.

If there is disagreement with the decision of the department or agency, the next formal review process can be taken by the President. In practice, agency actions which invoke interest at the Presidential level are usually identified in advance and guidance is given to the Department before the decision is made. For this category of actions, the Council, as the chief advisor to the President on environmental matters, becomes more deeply involved. Examples of such actions are the application for permits to operate new off-shore drilling platforms in the Santa Barbara Channel, the Alaska pipeline, and the Tocks Island Dam.

Another opportunity for evaluation is by Congress for those actions which require funds or other Congressional approval. Examples not requiring Congressional approval would include cases where the only Federal action required is the issuance of a permit. Illustrations are the recent proposal to build another bridge across San Francisco Bay and an application to fill in a section of a bay in Florida in order to construct a trailer park. The Coast Guard had permit authority over the bridge since it could be a navigational hazard. The Corps of Engineers had permit authority over the fill permit since it involved discharges into navigable waters. The permits in both cases were denied, not because the proposed actions posed threats to navigation, but, under the authority of NEPA, because of environmental reasons.

In Congress the debate which occurs within the Congressional committees and on the floor itself, as exemplified by issues such as the SST, provides another opportunity for the informed public to input into the decision making process and to further evaluate the decisions by the Executive Branch.

Still another method for evaluating the adequacy of the environmental impact statements and the correctness of the decisions made as a result of them is through the courts. The Calvert Cliffs case, which I mentioned earlier, is an excellent example of this.

How does CEQ insure that the environmental impact statement mechanism works efficiently? I have already mentioned the guidelines which we have published and which are periodically reviewed and updated. In December of each year we have meetings with the departments and agencies to review our guidelines and their procedures for implementing them. Public comment is invited on this process. For example, last month a formal invitation for public comment was issued in the Federal Register (Volume 36, December 11, 1971, page 23666).

Another way in which CEQ implements its responsibilities is through an informal review of the copies of the draft and final statements. A portion of the staff of CEQ focuses on impact statement evaluation. They try to read each one that comes through and identify which ones should merit further evaluation at the Executive Office level. Of course, this evaluation comes from more than just the statement itself. Other inputs include the correspondence which CEQ receives, the public media, and the personal contacts which we have with members of the public.

We try to see that the public is kept informed of the statements which are filed. This is accomplished first through the "102 Monitor," a monthly publication of the Council, which identifies the new statements filed during the past month within each department, the person in the department to contact concerning these statements, and also comments on issues, such as the Calvert Cliffs decision, which have bearing on the environmental impact statement process. The second formal Federal distribution method for these statements is through the National Technical Information Service, from which copies of statements can be purchased at a nominal cost.

Environmental factors have always been a big consideration in the personal lives of most of us. Now, like death and taxes, they are an integral part of our professional lives. Congress, through the National Environmental Policy Act, has established the framework to consider and implement procedures to enhance and preserve the quality of our environment. The administrators in the Executive Branch are beginning to implement these in their decisions and actions. The judgements of the courts are strengthening the implementation of the policy established by Congress. Some people would like to ignore or downplay environmental factors, particularly when costs are involved. But this simply cannot be done if we expect to preserve and enhance the quality of life for our and future generations. As I read the trend, the easiest way to fulfill the spirit of NEPA is to place the cards out on the table and make explicit value judgements in the most objective manner possible. The problems, trade-offs, and effects must be delineated and then decisions made. If these decisions are made in a straight forward manner, then there should be no qualms about defending them. We can expect controversy since these decisions involve resource trade-offs, great financial costs, and value judgements. This is healthy.

In the past many decisions were not made in a straight-forward fashion and hence could not be defended when the public spotlight was directed on them. At the other extreme is the danger of people who make decisions in a straight-forward manner and then shy away from defending them because of the hue and outcry which various extremist groups cause. We must not fall into either of these traps. As James Baldwin says:

> "Not everything that is faced can be changed,
> but nothing can be changed until it is faced."

SUGGESTIONS FOR IMPROVEMENT OF THE ENVIRONMENTAL IMPACT STATEMENT PROGRAM

Neil Orloff*
Assistant Director
Office of Federal Activities
Environmental Protection Agency
Washington, D.C.

Major problems have been witnessed in most stages of the environmental impact statement program. Problems arise in determining the proper point in the agency decision-making process when the question should be faced of whether to prepare an impact statement, in deciding whether an impact statement should be prepared for a particular proposed action, in writing an impact statement once a decision is made to prepare one, in circulating the impact statement for comment, and in integrating the major conclusions of the final statement in a meaningful way into the overall decision-making process.

This paper discusses some of these problems, and provides suggestions for solving or minimizing them. The Council on Environmental Quality's guidelines provide, pursuant to Executive Order 11514, the framework for implementation of the impact statement program. Accordingly, particular attention has been given in this paper to how CEQ's guidelines could be revised to implement the suggestions.

I. Decision on Preparing an Impact Statement

CEQ's current guidelines directly address in Section 2 and Sections 5(a), (b), and (c) the timing for this decision and criteria to be used in making the decision. In Section 2, the guidelines state that, "As early as possible and in all cases prior to agency decision. . ." an impact statement shall be prepared. In Section 5(a), the guidelines say that actions for which impact statements may be required include recommendations or favorable reports on legislation and projects and continuing activities directly undertaken by Federal agencies. In Section 5(b), the guidelines state that the statutory clause "major Federal actions significantly affecting the quality of the human environment" should be construed with a view to the overall effects of the actions contemplated; and in Section 5(c), the guidelines state that the agency should assess a broad range of environmental factors.

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*The comments in this paper reflect Mr. Orloff's personal views. They do not necessarily represent the official position of the Environmental Protection Agency.

The intent behind these guidelines appears to have been to leave it up to the individual agencies to define with specificity the situations when an impact statement needs to be prepared. In practice, however, this has been done in few cases. Agency implementing regulations frequently skirt the questions surrounding the decision to prepare a statement with ambiguous phrases. For example, the Forest Service's regulations state that an environmental assessment shall be prepared "as early as possible and in all cases prior to agency decision. . . ."

There appear to be two major causes of this problem. The first is that Federal agencies have attempted to implement the requirements of NEPA in one broad sweep. Agencies have tried to group substantially different activities within one set of procedures. And in doing so, the agencies have ended up with guidelines so general that they often are not very helpful.

The second major cause of the problem appears to be that the conceptual steps involved in reaching the stage of writing an impact statement are frequently not well understood. At least six distinct steps can be identified. The first is to categorize for each bureau (or sub-bureau) of an agency those types of actions which are likely to involve environmental effects. The second step is to identify for each of these types of actions the environmental considerations frequently involved, e.g. sulphur oxide emissions, sedimentation, heated water discharge, accidental spill of toxic substances, etc. The third (large) step is to identify what basic information on these environmental effects needs to be gathered, who is to gather it, and when it is to be gathered so that a reasoned decision can be made on whether an impact statement should be prepared. The fourth step is simply to designate a specific point in the various decision-making processes by which time the decision should be made on whether an impact statement is required. The fifth step is to provide detailed guidance on the considerations involved in making this decision. The procedures frequently say that the decision is a matter of judgment. This is correct, but this skirts the question of what factors are involved in reaching a judgment. Included here, for example, would be detailed guidance on what to do about projects already partially constructed. Finally, the agency must provide procedures for implementing whatever decision is reached. There should be follow-up, even in the situation where the decision is made not to prepare a statement.

CEQ has recently issued a notice of impending revision of its guidelines. Given the ambiguity which surrounds most agencies' implementing regulations, it would be desirable if CEQ's new guidelines required each agency to prepare detailed information on each of the above six steps. Field personnel of Federal agencies are usually responsible for deciding whether an impact statement should be prepared. Accordingly, it is important for them to receive clear guidance on how to approach making this decision. If NEPA is to be effective, it will be in large part because of a clear awareness by the field personnel of the environmental inquiries that must be made.

II. Notification to Public of Decision on Whether an Impact Statement is to be Prepared

With the exception of EPA and the Federal Highway Administration, it does not appear that Federal agencies' procedures provide for public notification of whether an impact statement will be prepared for a specific action. EPA's procedures provide that, after a decision is made on whether an impact statement will be prepared, either a "notice of intent" or a "negative declaration" will be published. The notice of intent states that a decision has been made to prepare an impact statement. The negative declaration states that a decision has been made not to prepare an impact statement.

There are a number of advantages to this public disclosure. In the case where an impact statement is to be prepared, it provides an opportunity at an early stage in the planning process for all interested parties to express concern about and provide guidance on the environmental effects involved. Although an opportunity for comment is provided at the draft impact statement stage, in practice planning for the action is further along at this stage and modifications are thus more difficult to make. Another practical advantage is that publication of a "notice of intent" can potentially make the public more aware of the Federal Government's concern for and commitment to analyzing the effects on the environment of its proposed actions.

The other side of the coin is that nothing is lost by publishing a notice of intent. The public will almost always have an opportunity to comment on the draft statement; publication of a notice of intent only gives the public an early opportunity to express its views.

There are similar advantages to publication of a negative declaration. The public is again informed that an assessment has been made of whether the proposed action is likely to have a significant effect on the environment. If people disagree with this decision, they have an early opportunity to express their disagreement. In so doing, they provide the agency with an early warning of possible error in not preparing a statement. This early warning is far preferable to waiting until an agency is just about to take an action, and then facing the possibility of an injunction halting the action because an impact statement has not been prepared. Although suit for this injunction could still be filed at this late date, the Federal agency would be in a much better position to defend itself if it had filed a public notice of decision not to prepare a statement. Such publication would clearly weaken any suit alleging that no inquiry into possible environmental damage was made and that no opportunity was given the public to express its concern or to show cause why an impact statement should be prepared.

An argument might be made that requirement to publish negative declarations would be difficult to administer. The argument goes that a great number of proposed actions would fall into the category of no impact statement needed, whereas a much smaller number of actions would require impact statements, and thus agencies might be flooded by the requirement to publish negative declarations. The argument would be valid if negative declarations were filed for all actions, including such ones as purchase of an advertisement or promotion of an employee. But negative declarations are clearly not required in these cases. Negative declarations would only be required in the much smaller category of cases where an inquiry was necessary on whether a statement should be prepared, and where the decision turned out to be negative. In the above two examples, it is clear that no inquiry was necessary on whether NEPA applied to the proposed action.

III. Writing an Impact Statement

The majority of the impact statements are far too superficial. They lack the breadth and depth of analysis appropriate for an understanding of the effect on the environment of the proposed action. Substantial progress has been made by some agencies over the last two years in improving their analyses. Still, however, the majority of the analyses are very superficial.

Nothwithstanding sections (i), (ii), (iii), (iv), and (v) of 102(2)(C), five basic questions need to be addressed in preparing an impact statement. First, what is the proper project entity for purposes of preparing a statement? Clearly, neither the erection of lights, as part of a new airport, nor all possible sources of energy in the U.S., in the case of a new power plant, are proper project entities. Second, what is the range of environmental considerations appropriate for this project entity, i.e. what are the primary and what are the induced or secondary environmental effects that need to be considered? Third, what is the basic data about the project and its surroundings that is needed to investigate the environmental effects? Fourth, what analysis of this basic data is necessary, and what is the significance of the conclusions resulting from the analysis? Finally, what are the promising alternative formulations of the project that need to be considered?

The first question, that of defining a proper project entity, recurringly produces a dilemma. On the one hand, a broad formulation of the project entity often makes analysis unmanageably complex. Analysis is also sometimes extremely difficult because of lack of information at the level of the person preparing the statement. For example, the construction of an oil pipeline involves possible damage to the environment. It raises the question whether alternative forms of energy generation and transmission might be appropriate. Yet this is an exceedingly complex analysis to make, and requires information readily available to few people.

A broad formulation also results on occasion in too little attention placed on the particular action at hand. It may also result in unnecessary duplication of effort when statements are written on similar types of projects that are located in different parts of the country.

The other side of the dilemma is that a narrow formulation makes it impossible to put the action in perspective. In the case of individually small projects, cumulative effects of related projects are obscured. In the case of a single large complex project, and in the case of a chain of projects (e.g. the nuclear fuel chain), highly damaging components are sometimes justified on the grounds that the other components of the project are already constructed, and the benefits resulting from the small additional expenditure outweigh the damage.

As a solution to this dilemma, the new CEQ guidelines could require over-view impact statements to be prepared on appropriately defined groups of projects. These over-view statements would be in addition to the impact statement on the individual project or action. For example, it appears that over-view impact statements should be prepared on the Bureau of Reclamation's Frying Pan Arkansas Project, the Forest Service's program for timber supply and harvesting, the construction of water resource projects along the Colorado River Basin, the nuclear fuel chain, etc. Some of these over-view impact statements might require inter-agency cooperation. The statements of course need not reach conclusions on the desirability of any of these programs or parts of the programs (although in practice this is likely to result). Rather, the over-view impact statements would serve as background analyses enabling one to put the individually proposed actions in perspective.

Impact statements are frequently superficial, even in the cases where the project for analysis is appropriately defined. This superficiality appears to result from lack of guidance on how to do an environmental analysis, or even on what kind of basic information is required. For example, many highway impact statements prepared by field personnel do not contain estimates of the number or types of vehicles likely to traverse the highway. Yet it seems clear that the headquarters of the Federal Highway Administration could, without substantial difficulty, prepare a handbook to serve as a guide to preparing impact statements on highways. To date the guidance given by most headquarters offices of Federal agencies has been more procedural than substantive. EPA has been no less negligent in this area than have been other Federal agencies.

CEQ's new guidelines should therefore, I think, require each Federal agency to prepare conceptual frameworks for analysis for the major types of projects supported by the agency. As a start, conceptual frameworks for analysis should be prepared for highways (perhaps subdivided into rural, suburban, and urban highways), airports, sewage treatment plants, power projects, watershed projects, and mineral extraction on public lands (perhaps subdivided by type of mineral, type of extraction method, and character of the public land). These six categories of projects account, according to CEQ's November 102 Monitor, for 80% of all Federal actions for which draft or final impact statements have been prepared.

These frameworks should spell out the considerations in determining the proper project entity for analysis, the range of inquiry appropriate for the project entity, the basic type of data needed, the major analyses of the data to be performed, and the types of alternatives to be investigated. EPA is prepared to assist Federal agencies, within EPA's six pollution areas (air, water, solid wastes, pesticides, radiation, and noise), in their preparation of these conceptual frameworks for analysis.

In setting forth the range of environmental considerations appropriate for a particular type of project, the conceptual framework must go beyond obvious questions such as potential for air and water pollution. Two forms of shortsightedness have frequently occurred. The first is where the initial or primary effects of the project have been taken into consideration, but the secondary or induced effects of the project have been ignored. For example, statements on highways and sewage treatment plants seldom evaluate the impact on urban growth patterns resulting from the construction and operation of the projects. These secondary or induced effects may, however, be more damaging than the primary effects. The second form of shortsightedness is the tendency to consider only changes in the physical environment and to ignore possible alterations of the social environment. Yet impacts on population patterns or community behavioral patterns may affect the quality of the human environment much more than impacts on air and solid waste. This shortsightedness must be remedied. The conceptual framework for analysis should start us in the right direction by explicitly setting forth the range of environmental consequences to be considered.

The conceptual framework for each type of project would also set forth the basic information needed to do an environmental analysis. It is surprising how many impact statements contain no information on the ambient air quality or the existing degree of water degradation in the areas to be affected. This basic information is essential for an environmental analysis, yet it is usually not given.

Finally, the framework should produce a major advance in analysis of alternatives. (The AEC's recently issued guide to the preparation of benefit-cost analyses is exemplary in this regard.) The conceptual framework should require, as a preface to an analysis of alternatives, a statement of the objectives of the proposed action. A summary of the reasons for the stated objective should be included, along with the consequences of taking no action. The summary should be reinforced with a bibliography of materials that document the formulation of the stated objective. The framework should describe the range of alternatives generally to be considered and should require that all alternative actions that will also accomplish the stated objective be described in detail, including relative financial costs. Whenever an alternative will fail to accomplish fully the stated objective, the impact statement should clearly define to what extent it will accomplish the objective. The results of any cost-benefit analysis should always be included.

IV. Circulation of Statements

Universal Numbering System

There are presently on the order of 1,500 draft impact statements in either the preparation or the review stage. In addition, about 900 final statements have been filed so far. This mushrooming number of projects for which environmental analyses have been prepared is creating for EPA, and likely for other agencies, difficulty in keeping track of all the statements in the system. The problem is especially difficult since there is no generally agreed upon terminology to describe a project (how, for example, does one describe a 30-mile segment of transmission line--by the company building the line? By the counties which the line traverses? By the power plant from which the line emanates? By the town to which the line goes? By the national forest through which the line passes? By some esoteric combination of these?).

A simple solution to this problem would be for CEQ to implement a universal numbering system for all environmental impact statements. EPA has recently developed such a system, which CEQ may decide to use. EPA's system utilizes a four-part code, an example of which would be D DOT 40315-18. The first part, "D," tells whether the statement is a draft or final. The second part, "DOT," designates the Federal agency that prepared the statement. The third part, "40315," designates the type of project and also numbers the specific project. For example, in EPA's system, all numbers between 40000 and 48999 refer to highway projects; all numbers between 51000 and 51999 refer to airport projects, etc. The fourth part, "18," designates the State or territory in which the project is located. A more complete description of the system is contained in a supplement to this paper.

Circulation of Final Statement

Only a few Federal agencies presently follow the practice of sending a copy of the final impact statement to each party who commented on the draft statement. This practice should, I think, be made mandatory in the revised CEQ guidelines. Provision of a final statement would allow people who commented on the draft to see what changes, if any, occurred in the agency's environmental analysis as a result of their comments. The current system does not easily permit this, since in most cases there is no clear relationship between the time when a draft statement is filed with CEQ and the time a final statement is filed. However, this follow-up is often necessary if the final statements are to become more than just draft statements with attachments.

* * *

Substantial progress has been made over the last year in improving the impact statement program. A general awareness now exists among most Federal agencies of the need to consider environmental factors in their decision-making processes, and the impact statement program is taking firm root as the vehicle for launching this consideration.

Still, however, serious problems remain. This paper has discussed some of the outstanding ones, and made several recommendations. The recommendations aim at improving both the mechanics of the impact statement program, and the substantive analyses that emerge as a result of the program. What remains is actual integration of these analyses in a meaningful way into agency decision-making processes.

SUGGESTED UNIVERAL NUMBERING SYSTEM

$$\underset{(1)}{\underline{\text{D}}}\,\underset{(2)}{\underline{\text{DOT}}}\ \underset{(3)}{\underline{40315}} - \underset{(4)}{\underline{18}}$$

(1) Designates whether the statement is a draft ("D") or a final ("F").

(2) Designates the Federal agency drafting the statement (each Federal agency has a 3-letter code).

(3) A statement number which also serves as a code for the subject of the statement. A different number would be assigned to each statement prepared by a single agency. For example, all numbers between 40000 and 48999 refer to highway projects. Likewise, numbers between 51000 and 51999 refer to airport projects.

(4) Denotes the State or Territory in which the project is located ("01" through "57"). For those projects which are not identifiable with a particular location, the code "00" is used.

See the following pages for agency, subject, and State-Territory codes to be used.

Environmental Impact Statement Control Numbers (Agency Code)

Agency 1/	3-Digit Code
Atomic Energy Commission	AEC
Appalachian Regional Commission	ARC
Delaware River Basin Commission	DRB
Department of Agriculture	DOA
Department of Commerce	DOC
Department of Defense:	
Corps of Engineers	COE
Other	DOD
Department of H.E.W.	HEW
Department of H.U.D.	HUD
Department of Interior	DOI
Department of Transportation	DOT
Department of Treasury	TRE
Environmental Protection Agency	EPA
Federal Power Commission	FPC
General Services Administration	GSA
International Boundary & Water Commission--U.S. & Mexico	IBW
National Aeronautics & Space Administration	NAS
National Science Foundation	NSF
New England River Basin Commission	NER
Office of Science and Technology	OST
Tennessee Valley Authority	TVA
U.S. Water Resources Council	WRC

1/ These agencies represent all that have developed impact statements to date. New 3-letter codes can be assigned to additional agencies as the need arises.

Environmental Impact Statement Control Numbers (Subject Code)

Energy	00001-09999	
AEC Nuclear Development		00001-00999
Mining		01000-01999
Natural Gas & Oil:		
drilling & exploration		02000-02999
transportation, pipeline		03000-03999
Power:		
hydroelectric		05000-05999
nuclear		06000-06999
other		07000-07999
transmission		08000-08999
Military & Space	10000-19999	
Defense Systems		10000-10999
Military Installations		11000-11999
Space Programs		12000-12999
Waste Disposal	20000-29999	
Detoxification of Toxic Substances		20000-20999
Munition Disposal		21000-21999
Radioactive Waste Disposal		22000-22999
Recycling		23000-23999
Sewage Facilities		24000-24999
Solid Wastes		25000-25999
Water	30000-39999	
Beach Erosion, Hurricane Protection		30000-30999
Irrigation		31000-31999
Navigation		32000-33999
Municipal & Industrial Supply		34000-34999
Permit (Refuse Act, Dredge & Fill)		35000-35999
Watershed Protection & Flood Control		36000-39999

Environmental Impact Statement Control Numbers (Subject Code)

Transportation	40000-59999	
Roads (Ex Thru Parks)		40000-48999
Roads Through Parks		49000-49999
Bridge Permits		50000-50999
Airports		51000-51999
Aircraft, Ships & Vehicles		52000-52999
Railroads		53000-53999
Mass Transit		54000-54999
Land Use	60000-69999	
Land Acquisition, Disposal		60000-60999
Parks, Wildlife Refuges, Recreation Facilities		61000-61999
Forestry		62000-62999
Other	80000-89999	
International Boundary		80000-80999
Buildings		81000-81999
Pesticides, Herbicides		82000-82999
Weather Modification		83000-83999
Research & Development		84000-84999
Housing, Urban Problems, New Communities		85000-85999
Miscellaneous		89000-89999
Regulations, Legislation, Budgets, etc.		90000-99999

Environmental Impact Statement Control Numbers (State/Territory Code)

Region I

Maine	01
New Hampshire	02
Vermont	03
Massachusetts	04
Connecticut	05
Rhode Island	06

Region II

New York	07
New Jersey	08
Puerto Rico	09
Virgin Islands	10

Region III

Pennsylvania	11
Maryland	12
Delaware	13
West Virginia	14
Virginia	15
District of Columbia	16

Region IV

Kentucky	17
North Carolina	18
South Carolina	19
Georgia	20
Florida	21
Alabama	22
Tennessee	23
Mississippi	24

Region V

Michigan	25
Wisconsin	26
Illinois	27
Indiana	28
Ohio	29
Minnesota	30

Region VI

New Mexico	31
Oklahoma	32
Arkansas	33
Texas	34
Louisiana	35

Environmental Impact Statement Control Numbers (State/Territory Code)

Region VII

Nebraska	36
Iowa	37
Kansas	38
Missouri	39

Region VIII

Montana	40
North Dakota	41
South Dakota	42
Wyoming	43
Utah	44
Colorado	45

Region IX

California	46
Nevada	47
Arizona	48
Hawaii	49
American Samoa	50
Guam	51
Trust Territory Pacific Islands	52
Wake Island	53

Region X

Washington	54
Oregon	55
Idaho	56
Alaska	57

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Two Years of
Labor and Learning

THE FEDERAL HIGHWAY ADMINISTRATION

John J. Kessler
Assistant District Engineer
Federal Highway Administration
Madison, Wisconsin

I particularly appreciate the opportunity to participate in this conference with you today. Certainly the National Environmental Policy Act of 1970 is a landmark piece of legislation with far-reaching impact, and although the law has been on the books now for two years, we have by no means reached a point where we could call the implementation of this law a routine procedure. It is especially timely then to have a conference such as this where we can exchange ideas about our operating experiences and problems.

So that you may know what to expect for the next thirty minutes, let me outline briefly my presentation. I would first like to describe where the Federal Highway Administration is, at the present time, in implementing the National Environmental Policy Act of 1970 (NEPA). I would then like to discuss some of the problems our agency has encountered in day-to-day operations with NEPA and some of our more recent changes in procedures. And lastly, I will attempt to reserve a ten-minute period at the end of the talk to answer any questions you may have.

For those of you who may not be familiar with the Federal Highway Administration let me quickly describe our organization and give you some perspective as to the magnitude of the highway program. FHWA's principle role is to administer a grant-in-aid program in partnership with the State highway departments. The highway program is perhaps best known for the National System of Interstate and Defense Highways--roads like I-94 between Minneapolis and Milwaukee--but the program covers a wide range of projects and has been in existence for more than half a century with amazingly little change in concept, although it, of course, has changed in emphasis to adjust to what FHWA believed to be changing public needs and attitudes, to NEPA, and to other Federal legislation.

In very round numbers, FHWA administers annually a five billion dollar program (Federal funds) with 5,000 employees. The relationship between the size of the program and the number of employees is significant as I shall relate a little later in describing how we implement NEPA. Nationwide, five billion dollars translates to 5,000 individual projects annually, ranging from projects to increase the capacity and safety of a street intersection, to projects involving totally new multilane freeways through densely developed urban areas. To relate the immensity of this public works program to the Environmental Policy Act, more than half of all the environmental statements that have been submitted to the Council on Environmental Quality from all the Federal agencies have come from FHWA.

It has been a basic tenet of the Federal-aid highway program to work in a close partnership relationship with the recipient of the grant-in-aid, namely the State highway departments. Under this arrangement, State officials have the primary responsibility for planning and carrying out the highway program. Organizationally, FHWA has a division office in or near the capital cities of each of the 50 states, and the division engineers in charge of each of those offices have been delegated the authority, with few exceptions, to administer the program in their States. One significant exception to this delegation of authority involves the Environmental Policy Act and a closely related statute. I will elaborate upon that limitation in a few moments. Here in Wisconsin Division Engineer Robert H. Paddock, whom many of you know, supervises a staff of 30 permanent employees headquartered in Madison. He administers a Federal-aid program amounting to approximately sixty-five million dollars in Federal funds, plus matching State funds, annually.

With that brief introduction to FHWA, let me turn then to the subject of this presentation, "Two Years of Labor and Learning," for it has been just two years, two years and four days to be exact, since President Nixon on January 1, 1970 signed into law the Environmental Policy Act of 1970. Aside from its far-reaching philosophical impact, NEPA is administratively significant in two respects. First, the language of the law is exceptionally broad. For example, the part of the law pertaining to the preparation of environmental statements is applicable to major Federal actions significantly affecting the environment. What is major? What is a significant effect upon the environment? The legislative history is less than clear as to the intent of Congress. Secondly, although Section 103 of the law allowed until July, 1971, for Federal agencies to take such measures as necessary to bring their authority and policies into conformity with the intent of the law, the law is less than clear as to its application to projects already in the pipeline. While it seems unrealistic to believe the Congress intended that environmental statements be prepared for projects which were in an advanced stage of development on January 1, 1970, regardless of degree to which resources had already been committed to the project, it is precisely that issue which is being thrashed out in the courts today.

On the first issue, that concerning the broad language of the law, the Council on Environmental Quality issued interim guidelines for implementing NEPA in April, 1970, and the U.S. Department of Transportation, of which FHWA is a part, issued guidelines applicable to DOT programs about six months later. DOT's guidelines said that any Federal action significantly affecting the environment is, by definition, a major Federal action. Although this definition appears to wash out a significant qualification of the law and thereby increase the scope of the law's application, upon examination, I think you will agree that the effect of this provision of the guidelines did not materially alter the application of the law, but it did avoid potential arguments over what constitutes a major action. The guidelines also defined significant affects upon the environment.

It is in this area where there were honest differences of opinion within our organization as to the intent of Congress and I suspect this is true of some of the other agencies represented at this meeting today.

In effect, DOT's guidelines required environmental statements for a broader range of environmental impacts than those for which FHWA believed necessary. The following month FHWA issued instructions to its field organization. These were identified as interim guidelines (the Council on Environmental Quality has yet to issue its final implementing guidelines) which, in addition to reflecting the DOT guidelines, dealt with the second issue I discussed earlier--that of application of NEPA to projects in the pipeline. It may surprise some of you to learn that for major projects in urban areas, the time from the beginning of project planning to the time of construction often covers a period of ten years or more. While that may defy rational explanation, it is nevertheless factual. So on January 1, 1970 when NEPA became law, there were projects nearing the end of the pipeline which for all practical purposes represented an irreversible commitment of resources.

FHWA elected to handle such projects, and in fact any project in the pipeline, in the following way. The interim guidelines FHWA issued in November, 1970 established what was then a prospective cut-off date of February 1, 1971. If on that date a project had advanced to the point of having received design approval (design approval is a major benchmark in the highway planning and design process), preparation of an environmental statement would not be required. Nevertheless such projects had to be re-evaluated to assure that the projects were developed in a manner that would minimize adverse environmental consequences.

The FHWA's interim guidelines established another major policy--that of determining at which point in the highway planning and design process the requirements for processing an environmental statement are applicable. This point was designated as the corridor approval stage, the point (following a public hearing) at which one highway corridor, from among several alternatives, is selected for further development. The interim guidelines required for all projects, the preparation of an environmental statement or a "negative declaration," the latter being actually a positive determination that a statement is unnecessary, if you don't mind my twisting the words around a bit.

Procedurally, FHWA division engineers have the authority to approve negative declarations and to approve draft environmental statements for circulation. Final statements, however, must be approved by a Regional Federal Highway Administrator, in our case in Chicago, and even that approval must be concurred in by the Office of the Secretary. This is the one exception I mentioned earlier when discussing delegation of authority. Except for NEPA and Section 4(f) of the Department of Transportation Act--a section of law aimed at the preservation of parks, recreation areas, wildlife refuges and historic sites--the Secretary of Transportation has delegated to the Federal Highway Administrator all other authority to carry out the Federal-aid highway program. Since these exceptions are the only exceptions to the Administrator's authority, I believe they bear witness to the importance placed upon environmental consideration by Secretary Volpe.

If I have spent an inordinate amount of time in describing FHWA's organization and background in developing policies and procedures to implement NEPA, it is only to set the stage for discussing some of the problems we have had in the past two years. In the discussion that follows, I would like to link Section 4(f) of the DOT Act and NEPA together because, from our standpoint, the two are in many ways inseparable. If you will recall in the earlier part of my talk I mentioned the number of FHWA employees in relationship to the magnitude of highway program. Clearly, FHWA does not have the staff to perform environmental studies nor to prepare and process environmental statements. And even if we did, it would be a sharp break with a long-standing tradition of the Federal/State partnership in the highway program were we to do so. So even though the language of NEPA is phrased in terms of Federal requirements, preparation and circulation of environmental statements for Federal-aid highway projects is a function performed by the State highway departments.

For the most part, we believe the States have done a very good job in developing statements, given the suddenness of NEPA, the embryonic stage of implementing guidelines, and the general absence of criteria by which to evaluate environmental impact. I might add parenthetically that the Wisconsin Division of Highways has been identified as one of the States doing a better than average job in preparing statements. But while the States have done well overall, there was initially some inertia to overcome--perhaps a feeling that FHWA didn't really mean it when we indicated that we could not give project approvals until the environmental requirements had been satisfied, or, even if we did mean it, a feeling that FHWA was being unnecessarily bureaucratic in its implementation of the law. But I believe we are now beyond that initial period of adjustment and if anything, recent court decisions would lead to a conclusion that perhaps FHWA was not strict enough in its application of the law--particularly in regard to the retroactive effect of the law.

I mentioned briefly a little earlier the absence of criteria by which to judge environmental impact. In the Federal-aid Highway Act of 1970 the Congress recognized that deficiency and prescribed that environmental guidelines be promulgated and submitted to Congress by July, 1972. FHWA has recently circulated a draft version of guidelines it developed. When finally adopted, these guidelines should assist in achieving a comprehensive evaluation of environmental factors.

In terms of specific deficiencies in environmental statements, there initially was a tendency among some of the States to emphasize the beneficial effects of highways and to minimize describing the adverse effects. In a sense, the statements were used as a vehicle to justify prior decisions. I am sure that there was no deception intended. It is simply human nature to avoid a bad image. Of course, there are situations where a project may cause considerable adverse environmental impact but in spite of the impact, it is in the public interest to proceed with the project. With more experience in processing statements I believe the States are increasingly "telling it like it is," acceding to the adage that you can't make an omelet without breaking an egg.

Perhaps another problem area has been that of communication. The State Highway departments, like FHWA, are basically engineering organizations and to some extent the language of statements has been that of one engineer talking to another. The statements, of course, are reviewed not only by engineers but by others in disciplines normally not exposed to engineering terminology. By the same token, some of the maps and drawings were perhaps not as good as they might have been. But again, the quality of statements has already shown signs of improvement.

If I am beginning to sound a little critical of the State highway departments let me correct that impression. The highway departments, along with FHWA, have gone through and are going through a learning process, groping for ways in which to properly carry out the mandate of Congress. If the word groping sounds a little unflattering, let me hasten to add that I don't think the term has limited application to highway agencies. I believe it applies equally to agencies like the Environmental Protection Agency and the Council on Environmental Quality, and I certainly mean no disrespect in making that observation.

One problem that I believe will continue to plague us for some time is that of having other agencies, and even the courts, understand the complexity of the highway program. I mentioned earlier that FHWA applies the requirement for submitting a statement at the corridor approval stage. Although specific project details are as yet undeveloped at this stage, review agencies have asked for design details which in some cases are not established until the preparation of contract plans is begun. Conversely, if we were to wait until the design details were known before processing a statement, both FHWA and the States run the risk of being accused of having already irreversibly committed ourselves to a project. One alternative would be to process two statements for each project at appropriate intervals. It is my understanding that one State is adopting such a practice and another is giving it serious consideration, but there is a consensus among most agencies that the task of preparing even one statement is so demanding of time and manpower that to require more than one statement would be unreasonable.

The States have also been criticized for piece-mealing--that is, the submission of short project segments rather than submission of a statement covering a longer segment of highway. The criticism is that it is unfair to evaluate a short segment of highway when the immediately adjacent segment, the location of which is controlled by the first segment, may have significant environmental impact. Catching up with projects in the pipeline has been largely the cause of this criticism and the cause should vanish with the passage of time. However, it is not always an easy chore to select the best possible termini for a highway segment to be covered by an environmental statement. For example, in how many segments should the proposed 110-mile I-57 route between here and Milwaukee be covered?

Another problem that I will mention without much comment is manpower limitations. Those of you in the audience who represent Federal agencies are well aware of the Office of Management and Budget's directive to not only reduce manpower but to concurrently lower personnel grade levels as well, both objectives to be met in the face of new requirements such as NEPA. I know that many of the States are faced with similar budget constraints. Under such circumstances, if the full spirit and intent of

NEPA is to be fulfilled, it can only be done at the expense of other desirable programs.

There is one conceptual area in implementing NEPA that has caused us some concern. The guidelines issued by the Council on Environmental Quality call for both a draft and final environmental statement. In contrast, NEPA simply requires "a statement." Our concern is that there is a tendency for some to think of the draft statement as a vehicle with which to initiate a coordination effort with agencies having expertise in environmental matters, and that the final statement would then indicate the results of that coordination effort. The gospel that FHWA has been preaching is that even the draft statement should more nearly represent the completion rather than the inception of the coordination effort. If we didn't already believe it, our experience in administering Section 4(f) of the DOT Act for several years convinced us of that view. I believe that the State highway departments are adopting that viewpoint more and more.

Another problem area, can best be described by a somewhat amusing incident here in Wisconsin. The State, in cooperation with city officials, is proposing to construct a bridge across the Sheboygan River at Sheboygan. City officials applied to the U.S. Coast Guard for a navigation permit and submitted with their application an environmental statement prepared by the Wisconsin Division of Highways. The Coast Guard circulated the statement to other agencies including FHWA's office in Madison. At the same time FHWA's own procedures precluded our approval of the project until the State processed a statement. To avoid such obvious duplicative efforts to fulfill the same requirement of law, we have established a "lead agency" concept whereby the Federal agency having the principal interest in a project (FHWA in this example) processes an environmental statement. Agencies having a secondary interest then accept the lead agency's statement. Nevertheless it is interesting to note the differences among Federal agencies in the way draft statements are circulated for comment. The Coast Guard handles this chore for its applicants whereas under FHWA procedures, the State highway departments perform this function. This results in the peculiar situation of the Wisconsin Division of Highways having two procedures for fulfilling the requirements of NEPA--one for projects utilizing Federal-aid highway funds, and one for projects requiring a navigation permit but financed without Federal funds.

Of all the problems I have discussed, I suppose the problem of greatest concern to us has to do with the trend of recent court decisions concerning the application of NEPA. In the late summer of 1971, FHWA issued what we call a Policy and Procedure Memorandum (PPM). It superseded the interim guidelines I discussed earlier. Based upon the experience gained in working with the interim guidelines, the PPM aimed at correcting some of the deficiencies I have described and it clarified the retroactive application of NEPA.

Another significant change between the interim guidelines and the PPM concerns the type of projects or, more accurately, the type of environmental impacts for which statements are required. You will recall that earlier I mentioned some differences of opinion on this issue. Our operating experience and the experience of the agencies reviewing environmental statements, demonstrated that we simply were applying the requirements of NEPA too broadly. The PPM, prepared in cooperation with the Environmental Protection Agency and the Council on Environmental Quality, thus contains language which should reduce the number of statements processed by FHWA. Numerically, FHWA has been processing statements at a rate of approximately 1,800 per year nationwide. We now expect this rate to drop to about 500 per year.

But just when it appeared that with the passage of time since January 1, 1970, the dust was beginning to settle and we now had a good working document with which to implement NEPA, some very disturbing court decisions began to emerge. In effect, the courts are saying that FHWA does not have the authority to exempt from application those projects which received design approval prior to February, 1971. Perhaps it is too early to speculate on the impact of these court decisions (some of these cases are still pending in appeal actions), but we can't help but believe that the court's interpretation of NEPA is unrealistic, or if it is not, then the legislation is in need of revision. Just last month here in Wisconsin a project already under construction was ordered to be stopped by the U.S. District Court for the Western District of Wisconsin on the basis that an environmental statement was required and had not been prepared. Estimates of the cost of delay to the contractor, costs which must ultimately be borne by the taxpayers, have been reported as several thousand dollars per day. The plaintiffs in this case are five individual citizens who were not required to post bond by the court.

There are some who maintain that in any case of doubt as to whether an environmental statement for a project is needed (and remember the language of NEPA is broad and the applicability is unclear), an environmental statement should be prepared. But as holders of a public trust, I believe we would be derelict in our responsibilities if we blindly required environmental statements without due regard for the costs involved. And by costs I mean hardships to those who live in the paths of highways and must endure prolonged periods of uncertainty, and the denial of fast, safe and efficient highways to the public, as well as actual dollar costs for preparing environmental statements or for construction delays.

Not only have the recent court decisions been disturbing, but the number of court cases in which Federal highway officials have been named as defendants is increasing at an alarming rate. Last year no less than twenty-four court suits were initiated. Moreover, we believe that we are seeing only the first phase of legal actions--those which are based upon non-compliance with Federal law or procedures. We anticipate that the second phase will consist of legal challenges to the procedures themselves, or to the adequacy of environmental statements. While admittedly it is more difficult for plaintiffs to successfully challenge the adequacy of statements as compared to establishing non-compliance with law or procedures, it behooves us to prepare statements that will withstand any such challenge.

In summary, after two years of labor and learning, we are a little torn and tattered and in some cases perhaps a little bloodied, but we have survived. It is unfortunate that in some instances individuals, for totally selfish reasons, have used NEPA solely as a vehicle by which to stop projects with which they disagreed. But on balance, and once the projects now in the pipeline are completed, I believe that NEPA will help us to produce an even better product for the public. At the very least, fulfilling the requirements of NEPA should help to convince the public that what we are doing is in the best public interest or, failing that, it should at least establish that full consideration was given to environmental factors.

Certainly the Federal Highway Administration endorses a policy of preserving and enhancing the environment. Our policies, even without prodding Federal legislation, have reflected that goal for many years. Our only hope is that we will be permitted to pursue that noble goal as reasonable men. We have none but the public interest at stake.

THE U. S. ARMY CORPS OF ENGINEERS

Donald E. Lawyer
Planning Division, Chief of Engineers
Department of the Army
Washington, D.C.

It certainly gives me a great deal of pleasure to discuss the accomplishments, problems, and frustrations we in the Corps of Engineers have experienced in the two years the National Environmental Policy Act (Public Law 91-190) has been in existence. But, first, let me preface my remarks with the thought that we are still learning and I expect to gain much more information and insight on environmental impacts at this very timely conference than I will be giving.

To begin with I might explain a little about our missions, programs, organization, and size. The Civil Works program of the Corps of Engineers concerns the planning, development, and management of the nation's water resources. Our major programs fall into categories of flood control--reservoirs as well as local protection projects; navigation--locks and dams as well as waterways, harbors, and channels; beach erosion and hurricane protection projects; emergency operations; and issuing of permits under the 1899 R&HA on waste discharges effecting navigation. We have a civilian force of about 29,000 employees with 280 officers. This force is organized by Divisions (11) and Districts (39) with boundaries determined by major river basins and drainages, with a small headquarters staff.

Our annual budget for planning, construction, operation and maintenance, and management for water resource development, averages about $1 1/4 billion. At the present time we have approximately 300 studies underway, about 270 projects under construction, 360 reservoir lakes in operation, and are maintaining hundreds of miles of navigation channels and waterways.

We in the Corps feel that we have made a very vigorous as well as conscientious effort to fully implement the letter and the spirit of the National Environmental Policy Act; comply with the "Guidelines" as promulgated by the Council on Environmental Quality; and comply with other administrative policies and procedures.

We issued instructions regarding NEPA to our field offices beginning in March of 1970, with the first major contribution being our Engineer Circular in September 1970, which gave guidance on procedures for handling and preparation of environmental statements. This guidance was further refined as an Engineer Regulation and published in the Federal Register on June 11, 1971 for public comment and I am happy to report this Engineer Regulation has been revised in light of the comments received and is now at the printer.

I feel that I should define for you how the Corps views the environmental statement and its relationship to our planning and decision-making process. All of our projects are developed thru a complex planning and evaluation process with a great deal of coordination with other Federal agencies, State and local agencies, and the general public. This process results in a project report which reflects all aspects (engineering, economic, and environment) studied and evaluated. This is the decision document.

We have made environmental considerations a deliberate part of each of our planning studies. Our planning procedures have been modified so that environmental aspects keep in step with the engineering, economic, and social well-being aspects of the study. Consideration of the environment is not separate and apart from the planning of the project, but is completely integrated. The environmental statement, as required by Section 102(2)(C) of NEPA, is a summarization of the environmental effects and impacts considered in the course of the study. The EIS is not the decision document. Generally the EIS is based on data and information developed for the study and contained in the project report. Rarely will new and original data be developed for the EIS.

At this point, I would like to bring out one aspect that has become very important in the last couple of years--that is public participation. We have always worked with the public in the conduct of our studies, holding public meetings, etc., but now a deliberate participation program, including numerous public meetings, small group work shops, information newsletters, and other methods to generate public interest, is a part of the project planning process. As with any new program, we are having our problems and frustrations of implementation, but they are being resolved. The response we have had so far indicates that the public is enthused with this program of public participation.

So much for generalities on our program, now what about our environmental statements? To date we have filed over 414 statements, 265 final and 149 draft statements. Some of these are quite good and others not so good, especially those we prepared and filed in the middle and last half of 1970. At that time, we had a job of communicating to our field planners just what was meant by the law, the Council "Guidelines" and also what was expected from them. Now I can say our consistency is getting better and the overall quality of the statements is a great deal better. In fact, since the Council's "Proposed Guidelines" were issued in February, final in April, and our amplified guidance in June, there has been a marked improvement in coverage, content, depth, and applicability of Corps statements.

One of the frustrating points became very apparent in early 1970--"How to get on top of the workload." As you know, NEPA applied to all Federal actions that significantly effect the environment, not just actions that were initiated after January 1970. When NEPA was signed, the Corps of Engineers already had environmental oriented staff, such as fishery and game biologist, limnologist, foresters, agronomists, recreation resource planners and some engineers who were very attuned to the environment and the effect of our works upon it. This is the staff that felt the heat and the push to develop adequate environmental statements.

I would hazard to guess that when NEPA was passed we needed to prepare in excess of 2,000 environmental statements, just to catch up and become current. Because of this huge backlog the Council on Environmental Quality (CEQ) and the Office of Management and Budget (OMB) allowed us to set up a three-year schedule to complete EIS for all continuing construction projects and complete projects in an operation and maintenance status. We are vigorously working on this backlog in order to become current.

In the last two years we have taken numerous steps to increase our in-house environmental staff capability by hiring new staff with life and natural science backgrounds and education, but most of these are young inexperienced men that need some on-the-job training to become fully productive. We have taken and are continuing to take actions to train our existing staff through work shops, seminars, university short courses, and granting leave of absences for further college education. But all these actions will take time to obtain maximum results, so we still are faced with a real workload problem. However, there is a light gleaming at the far end of the tunnel.

Currently, we are developing additional guidelines on environmental effects and impacts giving careful analysis to environmental matrix system developed by Dr. Luna Leopold of the U. S. Geological Survey and to the weighting system developed by the Battelle Institute for the Bureau of Reclamation. Results from on-going and complete environmental studies, consultant reports, these other evaluation schemes, and court decisions are continually being evaluated to improve our knowledge and methods of evaluation. Currently instructions are being prepared so that our field planners can develop an "atlas" of environmental things. To begin with this "atlas" will be very gross and dependent upon the input and knowledge of many organizations and individuals, but will result in a working document of considerable assistance to our planners. We are also developing guidelines on evaluation and assessment. The 1970 R&HA requires that such guidelines be prepared and promulgated by 1 July 1972.

We are also relying on consultants and universities to provide us with specific environmental inputs and assessments for our studies. I feel very confident that the projects presently being studied will incorporate adequate environmental considerations of alternative courses of actions as well as the accepted plan, will fully comply with NEPA, and will have public acceptance. Our planning process will insure this, but it will take more dollars and more time.

We are experiencing our greatest difficulty with projects that "are in the pipeline"--that is, those projects authorized and under construction prior to the enactment of NEPA. On these projects the opportunity to study and evaluate a full range of alternatives are much more limited. However, to the maximum extent feasible, alternative solutions and opportunities for environmental enhancement, preservation, restoration, and mitigation are being investigated and incorporated into the project to the maximum extent feasible. On a good many of these projects, construction is well underway and in some instances almost complete. But we are conducting various studies to assist us in implementing further actions to enhance the quality of the environment as it relates to the particular project.

To highlight how increased emphasis on environmental considerations has been incorporated into Corps projects and resulting in changes, I would like to cite a few examples:

- Reviewed and changed many reservoir operation schedules to enhance fish spawning, hold higher water levels during the recreation season, minimize late summer exposure of mud flats, and provide additional flows for downstream water quality.

- Incorporation in all construction contracts of environmental protection specifications with specific safeguards on environmental degradation related to the construction activities.

- Incorporation in leases, licenses, and concession agreements of stringent conditions regarding environmental quality standards and activities that may degrade the quality of the environment.

- Hold pre-construction conferences with the contractor to review and discuss environmental aspects of the work, the plant layout, location of construction roads, and living areas to minimize their impact on the environment.

- A scenic river development plan has been developed for the Hatchie River in conjunction with the U. S. Soil Conservation Service and the Tennessee Department of Conservation

- Specifications for top bank land clearing in connection with Mississippi River revetment work have been revised to minimize the amount of right-of-way needed and the number of trees cut.

- The survey report on the local protection project at Fremont, Ohio contemplated a drop structure for energy dissipation. Pre-construction planning determined that a riprapped friction channel would serve the same purpose and would permit passing of spawning fish runs. Provisions were also made to minimize stream profile disturbances in an attempt to retain to the maximum feasible extent the existing pool-riffle complex.

- Duck Creek Channel Improvement Project, Texas, has been modified to include special design for enhancement of the channel, reflecting pools, esthetics, and greenbelt trails. These types of features are being incorporated into the design of San Antonio, Elm Fork, and Fort Worth Floodway channel projects.

- Projects Modified.

  (1) Big Walnut Reservoir, Indiana. Moved dam site.

(2) Oakley Reservoir, Illinois. Elimination of downstream channel and substitution of greenbelts.

(3) Morrison Creek, California. Provision of open space to save unique wildlife habitat.

(4) La Farge Reservoir, Minnesota. Installation of multiple-level outlet which will create a new trout fishery downstream.

(5) Red River Reservoir, Kentucky. Moved dam five miles downstream to preserve a valuable and unique scenic gorge.

(6) Tennessee Colony Dam, Texas. Moved site upstream to preserve valuable hardwood forest, new penal farm, and a major wildlife area.

(7) Columbus Lock and Dam, Mississippi. Moved dam site upstream to protect valuable paleontological site. Corps has recommended the site be registered as a National Nature Area.

* We have also terminated projects.

(1) Buffalo Bayou, Texas. Channel modifications to increase discharge capacity.

(2) Carrabelle to St. Marks River, Florida. Part of the Gulf Intra-Coastal Waterway. Project would create significant adverse environmental impacts and effects on the Alligator Harbor - St. James Island area and the long-term environmental loss would be far greater than the benefits derived from the project.

(3) Jack and Simmerly Sloughs, California. Channelization and levees to protect land periodically flooded.

In closing I might mention that we have having our share of court litigation. Most of the 13 cases in litigation involve projects that have been under construction for some time, 6 of which have been stopped by court action to date. The only permanent injunction so far is on Gillham Dam, Arkansas, where further construction of the project is stopped until an environmental statement satisfactory to the court is filed. We have now completed studies and prepared our statement and filed it with the Council on Environmental Quality. The Court now will have to see if it is satisfactory and meets the courts objections.

With the high backlog of statements to prepare (for projects authorized and in planning or under construction) we had to make decisions on where to expend the limited resources available to us and prepare statements on the most critical projects. We evaluated the projects in our program and started with those known or felt to have serious concerns or significant environmental impacts especially where proposed actions were such as to preclude the possible adoption of alternative plans. One that we missed was Cooper Lake and Channels Project, Texas. We were unaware of any unresolved conflicts until suit was brought by the Texas Committee for Natural Resources. As no environmental statement had been filed, the court issued a preliminary injunction stopping all construction work pending filing of an environmental statement. A contract for environmental studies has been awarded to East Texas University to form the basis of an environmental statement.

This briefly is a capsule recap of our two years of labor and learning and what has been to the Corps of Engineers a very challenging period.

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Other
Environmental Impact Perspectives

UWGB: ITS ENVIRONMENTAL FOCUS AND IMPACT

Edward W. Weidner
Chancellor
University of Wisconsin-Green Bay

Two years of the "decade of the environment" are behind us. Despite all the effort that has been expended on developing a concern for environmental quality, we still encounter wide segments of the population that believe that environmental degradation is the result of a few careless engineers and a few thoughtless industries. Millions of dollars and millions of man-hours later, we have yet to develop an adequate definition of environmental quality let alone an adequate commitment to an environmental ethic.

In 1966, planning began for a new institution, the University of Wisconsin-Green Bay. The planners concluded that higher education was far too aloof and far too unconcerned with the major problems of the world and the sense of social responsibility of graduates. A university-wide focus on a significant problem would help avoid these pitfalls. Among the major problems of the world, man and his environment seemed to merit special attention, for reasons so obvious that they need not be outlined here.

Thus it was that in the fall of 1969 the University of Wisconsin-Green Bay opened a new university with a total institution-wide emphasis on man and his environment. Chemistry, biology, sociology, business administration, art, literature, and other fields and professions were to be taught in such a way that their application to the problem of man and his environment would be highlighted. Graduates with any of these specialties would be better able to understand their own social responsibilities. Through general education courses, an environmental awareness and ethic would be developed which would be strengthened by strong off-campus experiences with community environmental problems. Hopefully, all graduates would make contributions in their respective fields in regard to environmental matters. In addition, understanding and experience in regard to one major social problem might well lead to an enhanced concern for other social problems.

There would be no excuse at the new university for blaming a few engineers or a few industries for a problem that was nationwide and for which every individual was in part responsible. There would be no room for the sophistry of pretending that some men were innocent bystanders. Acceptance of social responsibility was explicit in the academic plan and the time was now. This acceptance had to be by all people, from all kinds of disciplines and professional aspirations.

Because of our educational commitment at UWGB, we have naturally tried to create as model an environment as possible at our new campus along the shores of Green Bay. We began by developing our academic plan and our physical plan, and then marrying the two. This was accomplished only after considerable study and deliberation. And yet during the first two years of operations at our new campus, 1969-71, it became apparent that these planning documents were not adequate for all time, nor were they self implementing. And the logic behind them was not necessarily evident to each newcomer.

Under these circumstances, and upon faculty advice, we developed our own Environmental Impact Board paralleling in some ways the environmental impact procedures of the Federal government and a few states.

The Board holds regular meetings, frequently weekly, and issues an excellent set of minutes. These minutes are widely distributed and read with care. The Board can advise the Chancellor, any other senior administrator, and even a faculty-student committee. If it chooses to do so, the Board can inquire into any environmental problem on its own initiative. On the other hand, all committees or officers of the University carrying out projects of any major importance for the University environment, must submit a statement of environmental impact to the Board in advance, and the Board must have an opportunity of setting forth its views. While the conclusions and recommendations of the Board are purely advisory, it is already apparent that this advice will almost invariably be followed. Quite naturally there has been a phasing-in problem in the short run, since many projects were underway at the time the Board was established. But for future projects, the influence of the Board is impressive.

I am reviewing the Environmental Impact Board of the University of Wisconsin-Green Bay in some detail not because it is quite distinctive for an institution such as a university - which it is. Rather, I am reviewing its experience primarily because we believe that UWGB has encountered in the last few months, in capsule form, the same kinds of problems that underlie environmental impact analysis at the federal or state levels.

For those who take environmental impact analysis seriously, there are a series of administrative problems. One of these is the type of statement and analysis required before the Board reviews a proposed project. It is not easy to define the kind of statement that is adequate in terms of presenting the possible environmental impact of a project. Secondly, the time and energy of personnel, and the dollars that they represent, are a consideration. It is obvious that an organization that waits for an environmental impact analysis cannot proceed with the same dispatch and the same short-range economy of effort as an organization that does not worry about such things. The timetable of organizational effort is effected by environmental impact analysis. However, the welfare of society is a long-range, not a short-range matter, and it has become apparent we must as a society afford the expense of environmental impact analysis. Thirdly, it takes time for administrators and clienteles to get to feel comfortable with such a procedure. There may be fears that an Environmental Impact Board will be unreasonable, or that someone may try to "hang" a particular project through this means. Indeed, these fears sometimes may be justified. And it is well to remember that not all well-intentioned persons will come to the same conclusions with the same data in hand. Still, it is better to have analysis objectively set forth, than to proceed by rumor or by tour de force.

However, far more fundamental concerns have surfaced in UWGB's experience with environmental impact analysis. Anyone who has engaged seriously in such analysis for very long is confronted with the fundamental question, "What is an impact - what is an unhappy or undesirable environmental impact?" No one can answer this question without reference to long-range plans for the use by people of the water, air, and/or land affected by a project. For the most part, such long-range plans do not exist. Existing planning and zoning is both spotty and frequently short-run. Developing plans for long-range use tends to run counter to accepted ideas of private property. It implies restricted access to the natural environment. It is difficult politically. But unless such plans are made, we will not be able to answer fully the question of what a desirable impact or an undesirable impact might be.

There is another problem in identifying an environmental impact. Many think of an impact as being purely bio-physical. Apparently their view is that there is an undesirable impact if in some way a project infringes on an assumed original state of nature. Others feel that an impact is undesirable if it in some way changes existing land use. These are views of impact which are entirely too restrictive. There are legitimate new uses of resources as well as legitimate old uses. There is a socio-cultural environmental element as well as bio-physical. A future plan for use of an area including the socio-cultural use as well as the bio-physical is essential before measuring and determining the importance and desirability of a particular impact.

For example, at the University of Wisconsin-Green Bay we have developed three use areas within our circular 1,000 acre planning area--an intensively used, roadless academic center section, a peripheral arboretum, and, in between, a less intensive use area including vehicular access, parking lots, playing fields, and social and housing facilities. Until the University has defined all three of these areas both in bio-physical and socio-cultural terms, the Environmental Impact Board of UWGB cannot make effective judgements on environmental impact, nor can the responsible committees or officers of the University.

Let us not deceive ourselves. Neither a well thought-out master development plan nor an environmental impact board will bring magic consensus on the desirability of a project from an environmental perspective. There is no one "best" solution to man and his environment. All that can be asked of any of us is that we proceed on the basis of long-range plans, environmentally considered, and that through environmental impact analysis each project is tested for its appropriateness in regard to such plans.

To return to UWGB: the intensively used, roadless academic center section of our plan is farthest along. Still, it has been criticized by those who would prefer every building to have a view of the Bay. (Perhaps a kind of throwback to the picture window of our living rooms, or strip zoning!) The peripheral arboretum has recently been defined in detail, also. Still, some students have objected to the removal of an old barn and farmhouse that would obviously have conflicted with the naturalizing of an essential segment of the periphery. The center circle in our planning area is the least developed conceptually. Even so, there is little consistency in the environmental advice we receive in regard to it.

No, we who are concerned with environmental impact analysis are not launched on a search for a new general will, presided over by a haughty and arrogant new elite. Rather, we are engaged in an attempt to be environmentally aware by making impact analyses and to permit interest citizens and groups to have their views considered before making decisions with important environmental consequences. We must remember that there will seldom be only one desirable environmental alternative--on occasion there may be none--and there seldom will be total agreement among those highly concerned.

Thus it is that UWGB has a direct operational interest in the outcome of this Conference, as well as a broad institutional interest in the proceedings stemming from its focus on man and his environment. We look forward to cooperating with Federal, State and private agencies in their planning and development efforts in environmental impact analysis. We hope we can learn from you, at the same time we share our experiences with you.

A SYSTEMS APPROACH TO ENVIRONMENTAL IMPACT

John Armstrong
Director
Sea Grant Program
University of Michigan

Conceptually, NEPA represents a major step forward for the governing of our society and the rational use of our national resources.

1. It establishes a national policy of environmental concern against which all governmental actions can be measured. With the establishment of this policy, it is no longer possible to justify unwise or potentially unwise projects solely on the narrow grounds that they are "necessary" of "of public benefit" to small segments of this populace.

2. Federal projects are more open to review, by the public, and by other federal agencies, before they are implemented. For under the best of conditions no single agency, no matter how dedicated, can identify all of the possible alternatives to meet project objectives. Understandably, agencies are reluctant to wait for a general consensus of permissibility before starting a project. But through the procedures of the Section 102 impact statements, some good alternatives have been suggested, and some projects of probable high adverse impact have been altered or dropped.

3. Particularly through the courts, the procedural requirements of NEPA have expanded the ability of the public to have some say in what actions its government takes. Public participation in government, particularly at the federal level, remains a complex problem. The provisions of NEPA have allowed some degree of public entrance into the federal decision-making process while hopefully excluding uninformed disruption of federal activities.

4. Perhaps the greatest virtue of NEPA, and the reason for viewing this act as a major advance in the governance of our society, is that it reflects a move towards a more systematic approach to governmental decision-making. It is perhaps the first major national recognition, that, in a modern complex society of millions of people, all elements are interconnected. NEPA is one of the first challenges to a historically incremental and fragmented national environmental resource policy.

However, it is clear that NEPA, while good, is not without its problems, particularly when considering the complex problems of the Great Lakes, NEPA, while a significant first step, may still be insufficient.

Considering the experience and background of those in attendance tonight, and the subject matter of this conference, I will not take the time to list all the procedural and conceptual problems connected with NEPA. However, I would like to mention a few, either because they are of particular importance to the Great Lakes, or because they cannot be over-emphasized.

1. One problem which must be solved if the Great Lakes as a natural system, is to be successfully managed, is how to build a stronger working relationship with Canada.

At the present time there is no formal Canadian input into the Section 102 impact assessment process. Canada has been informed that they are welcome to submit any information which they feel pertains to various United States projects, and that they have the same powers as any other sovereign state in the U.S. courts. In actuality, Canada is reduced to the level of submitting diplomatic notes. The International Joint Commission needs more ability to deal directly with counterparts, not at just high levels.

There are several possible solutions to this problem. The formation of a bilateral court to hear disputes over environmental matters is one. Successful completion of the treaty and expansion of the International Joint Commission will be helpful. But no matter what the solution, Canada should be permitted a stronger voice. In addition, we must find methods that are effective at less than the treaty or diplomatic level. Research and information gathering is restrained by archaic and binding diplomatic procedures. We need to have more freedom to deal directly with our Canadian counterparts.

2. CEQ. In spite of high professional quality, the Council on Environmental Quality is understaffed and underfinanced. Obviously, this problem is one shared by many federal and state agencies. However, CEQ faces another problem which, while not unheard of in other agencies, is somewhat unique.

CEQ's primary function is to serve as advisor to the President on broad policy matters and to undertake a general review of agency performance. But some segments of the public have demanded that it takes on the additional function of environmental ombudsman in relation to federal and state agencies. Often the public feels that CEQ does or should have the power to demand impact statements and to stop projects if the assessment is negative. This is not its function, it is not properly designed to carry out this function, and as a result, it is in a serious conflict between serving the President and serving the public. One result of this situation may have been to shake the public's faith in government and to obscure some of the real potentials of NEPA. It is interesting to look at the number of 102 statements over 2000--one becomes concerned about the depth in which such critically important statements can be reviewed.

3. Agencies and information. It has become clear that one of the greatest problems in meeting the requirements and objectives of NEPA is that of insufficient information. The basic concept of NEPA is to increase the amount and type of information which an agency considers before it implements a program.

In its first annual report, CEQ stated that:

> "The federal government need no longer be in the position of trying to repair damage to the environment after the damage has been done because the relevant factors were not considered at the time of the decision.[1]

Unfortunately, this is more a statement of desired outcome than fact.

One of the basic questions which has yet to be satisfactorily answered is just how an agency is to determine what the "relevant factors" are for a specific problem. What are the performance measures that best describe a particular environmental problem? The executive, legislative, and judicial branches all need a detailed procedure which could be used to arrive at this type of determination. The need for such a procedure is evidenced in the fact that many of the debates which have occurred over Section 102 statements, such as that for the Alaskan Pipeline, have centered around the question of what a sufficient statement consists of. Sufficiency may indeed be a function of the type of resource issue considered.

But even if this question can be resolved, there remains the very real problem of developing, within agencies, the ability to obtain and effectively use more relevant information. NEPA by itself can never meet its stated objectives until it is augmented by tools and procedures for dealing with such information.

BASIC CONCEPTS

Broadening and Comprehensiveness of NEPA. Congressional interest in technology assessment has been growing in recent years. Proposed requirements of such assessments are similar to the environmental impact statements of NEPA.

The basic premise of the proposed office of technology assessment or similar arrangements is that technology is affecting not only the natural environment, but also our social and economic systems. I think that it is instructive, when considering the possible future of NEPA, to look at the materials gathered by the House Subcommittee of Science, Research and Development. From these studies of the need for technology assessment and how to institutionalize it, it becomes clear that technology assessment is an advanced type of environmental impact statement;

and I would like to propose that until the two processes are somehow combined or related, we will make only limited progress in our ability to eliminate undesirable consequences of federal, state, and private actions.

Technology assessment is expensive. Initial attempts at technology assessment, carried out by the National Academy of Science, and others, indicate that even if assessments are held to a one-year time period, which in itself can be difficult, projected costs of each assessment will be in the $200,000 to $600,000 price range--meaningful environmental assessment may prove to be as or more expensive.

A number of executive branch reports have suggested that technology assessment and environmental impact assessment be combined, and be required of all executive agencies. Considering the personnel, money, and time constraints already encountered in attempting to deal with NEPA, there is no way under present conditions that each agency can carry out this type of assessment. Furthermore, as was pointed out in a 1970 publication by the White House National Goals Research Staff, assessment is of limited value without the guidance of some national growth policy. Assessment can either be used to limit or encourage growth, and different information will be required, depending upon which direction one wishes to take. With both technology assessment and environmental impact statements, there is no explicit indication of what is to be done with the information derived from assessments. I think it is fair to say that most people think that it would be a good idea to have detailed information on the potential results of a proposed activity. But there is in many cases considerable reluctance or inability to do anything with this information once it is obtained.

SUMMARY

Perhaps the most serious problem facing NEPA is that it is attempting to bring about solutions which cannot occur unless there are further changes in the goals and values of the nation, and of individual agencies.

However, the very existence of NEPA indicates broad-scale changes in the nation's goals. Just imagine how NEPA would have fared in 1872, or 1932, or even 1952.

NEPA and similar legislation is designed to provide decision-makers with more information, if they wish to use it. Historically, there has been a resistance to perceive the need for such information, and to incorporate it into the decision-making process. NEPA is helping change this. If all of the "relevant factors" were considered before a decision was made, then social, political, economic, and environmental factors would all receive equal consideration. This is beyond the limits of acceptability within our system.

The question of environmental information is basic to the NEPA concept. It is also a key factor in our entire philosophy of environmental management. It has long been recognized by concerned decision-makers that information is the key to successful management, and without adequate information, decisions are made either arbitrarily, or by invalid interpretation of environmental needs. Our lack of information about the environment and its behavior under man's influence is due to two very obvious causes: (1) our inability to gather together and interpret existing data about the environment (e.g., to convert existing data into usable information), and (2) a basic gap in our knowledge about certain environmental phenomena, regardless of certain available data or information.

This lack of complete information or understanding is, of course, the basis for the so-called conservative approach, where we take action based perhaps more on an intuitive feeling about environmental damage caused or that which could be caused by a project or activity.

This, in turn, has led to a trend towards stronger and more centralized authority over environmental matters, for if we are to take a conservative approach to environmental management, considerable authority is required. Contrast this with the situation where a good understanding of a particular environmental problem is at hand and where a solid data base is available to support that understanding. In this situation the requirement for authority may be lessened, by means of existing mechanisms and institutions, using the more sufficient information and knowledge.

My point here is that, I believe, our society has reacted to a lack of information about environmental problems by creating more authority to deal with the problems, i.e., to implement a conservative approach. I think this is justified, to a certain point.

I believe we are now close to that point. I would suggest that there is now a temptation to continue the creation of authority, particularly centralized authority, when perhaps there is no further need. I believe that the pendulum should swing back, just a bit perhaps; but we should now return to providing more and better information to the existing environmental management structure. In the Great Lakes our state agencies have, in most cases, viable organization, sufficient laws, and probably enough authority to deal with most environmental management situations. (I would exempt the problem of land use and development from that category.)

What the existing state agencies need now are more men, more money, and better information upon which to base decisions and formulate plans. Let me quickly point out that I would qualify this line of reasoning by including the variable, time. For information must be provided in sufficient time to have a positive contribution to environmental management. This, of course, leads back to a philosophy of conservation, for in some areas there indeed may not be sufficient time to generate adequate information to satisfactorily resolve an environmental issue--e.g., where there is a present indication of irreversible environmental damage occurring--so that we are never free of subjective decision-making about environmental issues.

Another factor that I haven't mentioned which is related to information is that of a lack of information about what the real desires and needs of the public are regarding environmental matters. All we know now is that the public responds to specific issues, but we know little or nothing about their real short- and long-term desires other than everyone seems to want a "good" environment. What is good? And how much are people willing to pay to obtain and sustain a good environment? This dimension of our lack of information as is the case involving technological information also influences our philosophical approach to environmental management. Many projects and programs are designed with the motto "The Most Good for the Most People." This very virtuous but rather meaningless approach leaves much to be desired with respect to use and protection of some of our limited resource systems, particularly in the Great Lakes. An example is the development of the coastal and shoreland area of the Lakes. Many of these fragile areas, if they are to be retained at even a fraction of their natural state, cannot possibly be developed or used by all user classes for multipurpose activities. There must be a recognition of the fact that most natural systems cannot be "all things to all people." But faced with a sometimes complete lack of information about what people really want, agencies have been forced to try and cover all bases.

The environment is still seen by many as something to be exploited by man (resources vs. commodity). There is still general failure to recognize that the complex societal goals of our system are totally dependent upon a viable biosphere, and that the natural system is not only influenced by, but also exerts a strong influence upon, these same goals. A good example of the effects of a lack of good information about the environment is found in the current controversy over the so-called Muskie Bill recently passed in the Senate and now being considered in the House. This legislation will have significant impact in the Great Lakes as it will across the nation.

Much of the debate over this legislation centers around the proposed change from water quality standards to effluent standards. Arguments over the merits and deficiencies of each type of standard are academic, and in my opinion ridiculous. Until we develop sufficient understanding and information linking effluent discharge to water quality levels, we will need standards for both. At the present time there is no scientifically acceptable information or methodology yielding the effect that a specific effluent will have on ambient water quality levels. In our limnological modeling program in Sea Grant we have made considerable progress towards this end, but by no means are we, or any other reputable research establishment, ready to determine standards.

Thus the arguments are over the wrong issue; the real issue is whether the total amount of pollutants entering the national system need to be reduced. At this time a conservative rationale is required. I believe we do need higher degrees of waste removal, but this is not based on sufficient information.

SOLUTIONS

In looking for solutions to these and other problems associated with NEPA, I think that it is important to emphasize moving beyond NEPA's rather limited boundaries. Three elements which I would like to stress are (1) the expansion of our definition of environment, thus increasing the concept of assessment; (2) the development of sufficient tools to allow the necessary assessment; and (3) the means of increasing the involvement of the general public at a time when "experts" and government are involved in more and more far-reaching environmental decisions.

(1) A first step in moving beyond NEPA might be to establish some form of citizen review outside of the executive and legislative branches, and outside of government bureaucracy. The Hart-McGovern Bill [House Bill 3055] is one possible alternative. This bill is based upon Michigan's innovative legislation which allows Michigan citizens to bring suit against anyone causing environmental damage. Passage of this legislation would allow citizen review of activities affecting the environment. While such a linkage to NEPA must be considered more a court of last appeals than a solution, it could easily be a permanent part of the nation's attempt to lessen the adverse impact of its activities. The obvious objection to such a step is that it might breed a crippling number of nuisance suits. This, however, has not been the case so far in the State of Michigan.

The question of citizen involvement is far from simple. What is citizen involvement? Who are the citizens that would be involved? Students come to me from student groups, representing youth and the environment. But do they really represent youth? The same applies to our whole society. What do people really want?

(2) Many suggestions have already been made for various forms of reorganization within the federal government. Perhaps one of the most interesting suggestions, if only because it has been around for thirty years, is for the formation of a Department of Natural Resources. Another possibility is to place CEQ or some other organization between the executive agency and the office of management and the budget. This organization could act as a clearinghouse for impact statements, feeding the agencies information upon request, checking with other agencies that might be affected, opening the statement to public review, and certifying that the required procedure had been carefully followed. This certification could be a prerequisite for budgetary consideration. There are many alternative reorganization patterns. The reason for considering some form of reorganization is, that until formal and informal linkages have been established between all parties who can affect the environment, the ability to obtain any environmental objective is limited. The problem in undertaking such reorganizations is that all too often the same thinking, the same approaches, and the same results continue, only now under a new name. And often the original objective of reorganization is lost in considerations of administrative or of efficiency or budgetary constraints.

(3) It is clear that one goal of NEPA was to reduce the adverse impacts resulting from agency activities. But the Section 102 impact statement requirements of NEPA place an unfair burden upon the agencies insofar as they were not given sufficient tools to develop the statements.

No matter what institutional arrangements are established to insure that all relevant factors are considered, they are bound to fail unless at the same time an effort is made to develop better methods and tools for determining what all the relevant factors are, making these available to those who propose an activity.

I would like to present to you, as people who could play a major role in implementing it, a concept which we have been developing as part of the University of Michigan Sea Grant Program.

Before stabilizing the water level of Lake Michigan, before channeling all of the sewage of southeast Michigan into Lake Erie, first we must emphasize the capability to properly assess these and other activities. I do not assume to have a complete definition of what a proper assessment would entail. It should certainly contain a consideration of both the adverse and the beneficial impacts of each activity upon the social, cultural, economic, technological, and ecological systems.

I suggest that the Great Lakes coastal zone system presents not only an ideal opportunity for a long-range cooperative research effort to establish the capability to undertake comprehensive analysis of resource utilization activities but represents one of the most rapidly developing resource subsystems of the Great Lakes. Social, economic, and political values will always play a major part in man's use of natural resources. But if, as indicated in NEPA, our nation wishes to reduce the number of adverse impacts upon our environment, we must have some type of comprehensive systems analysis capability, available to all, rather than continue to rely on values which usually fail to recognize the tolerances and dynamics of the human and natural systems.

One method of achieving such a capability would be through the use of what is called Space-Time Analysis (STA). I will briefly describe this, presenting it as an information system concept, rather than a specific proposal.

1. The first step in STA would be to establish a three-dimensional grid system for the entire Great Lakes coastal zone. This grid system would encompass the submerged lands, the water, the shorelands, to some extent inland areas, and the atmosphere.

2. On this grid system one would start a long-range project of mapping the parameters and variables of the natural system and subsystem components. If the results of all Great Lakes research could be placed in a standard space-time format, one could identify the parameters and dynamics of system components as they fluctuate over periods of time from minutes to years.

With this objective in mind, it becomes clear that cell size would have to be variable, and perhaps some cells would never be filled. But this approach would allow the coordination of presently fragmented and overlapping research, and would place it in a form which could eventually be used for day-to-day decision-making by management personnel. This approach would also help to identify where additional research is needed.

3. Once this system is established, one would be able to identify the potential impacts of human activities or sets of activities that do or might occur within the Great Lakes coastal zone.

We have identified a number of factors which influence the impact activity will have upon the Great Lakes coastal system.

a. Each human activity can be said to have a basic potential for disruption which will tend to be higher or lower relative to other activities. Thus snowmobiles would have more disruptive potential than cross-country skiing. This potential for disruption, combined with the natural tolerances of an area, will determine the intrinsic impact of an activity for a specific resource area.

b. The density and intensity of an activity are variables which can be other controlling factors in an activity's impact. Again using snowmobiles as an example, five snowmobiles per square mile can have considerably different impact than fifty, and leisurely sightseeing on these machines can have a different type and degree of impact than racing them.

c. The duration of an activity also is an important variable. Many resource systems can tolerate (we now know) a considerable amount of activity over short periods of time. However, they may be adversely affected if exposed to the same activity or sets of activities over extended periods of time. In the future one of the most effective resource management tools may be the scheduling of activities so as to match them to the tolerance time-spans of the areas affected.

d. In terms of activity assessment, the most difficult question is that of how the impact of one activity is affected by the presence of other activities. As an example, it is now widely recognized that the placement of a sewage interceptor line can affect the pattern of residential, commercial, and industrial development. It is also clear that transportation systems, utility corridors, and communications networks can have a similar effect. Under present conditions it would seem unreasonable and rather difficult for an agency to consider its proposed activity in relation to other concurrent activities. Yet the resulting impact of these interlinked activities can be synergistic or neutralizing. Incremental assessments concerned with fragmented sectors of the natural or human systems may not begin to identify all of the pertinent factors which should be considered.

It might be possible to get around these difficulties if all of the activities, and their impacts, could be interlinked in the inventory system mentioned earlier.

One could identify, for each activity, all of the physical elements necessary for it to occur. We call this an activity network. An activity network for recreational fishing might include the location of fish hatcheries, boat ramps, camping grounds, marinas, sport shops, as well as transportation networks and parking areas.

To deal with the impacts of these activity networks one could combine the impact factors which I have mentioned to construct impact networks for each activity and set of activities. These would indicate the often unexpected secondary or tertiary effects of an activity, which go beyond the immediate boundaries of the activity network and disrupt the dynamics of human and natural systems, and interfere with other activities.

For recreational fishing such a network might include a demand for better water quality, the increased demand for shoreland residential housing, crowded boat facilities, and conflicts with other water or shoreland activities.

If such a system could be established, the potential applications are at least in part, obvious, and I think sufficient to warrant further consideration. One of the most obvious applications would be to provide a service to state and federal agencies. Through the use of this design and management tool, an agency would now have the information needed to carry out a complex assessment.

It is in this area that the Sea Grant Programs may have a significant impact. The bringing together of research information and policy and strategy formulation. This relates to our goal of how to use research findings in policy making.

As a last recommendation to you, I would like to suggest a specific mechanism by which the question of information and concepts like the STA might be approached. As I mentioned earlier, I believe the need for further creation of management authority is not critical. There has been considerable discussion in the past three years about various institutional arrangements for managing the Great Lakes. I would again hypothesize that we need to pay more attention to development of sufficient information for existing agencies and institutional arrangements.

One could visualize, and I have, a management authority say for Lake Michigan made up of the four bordering states. I would propose, however, that instead of a management authority that we consider the creation of a "Lake Michigan Environmental Information Center." Such a center would be created as a non-profit entity by the four states bordering Lake Michigan. It would have responsibility to collect, assemble and display existing data on Lake Michigan. It would also have an in-house capability to carry out extensive monitoring programs of its own. It would not be a research institute, but rather a center for determining base line measurements, inventory of waste inputs to the Lake, projection of waste loads, assessment of the effectiveness of waste treatment facilities' construction on water quality, etc. It could contract with universities to carry out applied research in specific areas where a lack of fundamental knowledge regarding environmental quality was indicated. It could implement the space-time analysis concept that I discussed earlier.

It would be necessary to have state and federal agreement that any and all data gathered with state or federal dollars regarding Lake Michigan or its major tributaries be supplied to the Center.

Monitoring activities of the center would be for two major purposes: to assess the effectiveness and impact of the various state water quality regulations and to assess the effectiveness of waste removal programs in the states. As remote sensing technology develops via airborne and satellite applications, the center could coordinate ground truth and data collection activities for the entire Lake.

The center would, at regular periods, issue comprehensive statements regarding the flow of materials into the Lake and the water quality of the Lake as indicated by a variety of different indicators.

WHO? Senate Bill S.1113, the National Environmental Center Act of 1971, which has been passed by the Senate, is a possible starting point for such a cooperative long-range research program and center. Other federal and state purposes could be used to support this concept.

CONCLUSION

NEPA is a first step in allowing us to use the natural systems of this planet without destroying them, and without inadvertently changing our whole system. It is a good first step, signifying an immensely important shift in public attitudes toward natural resources, and hopefully many states will adopt similar legislation.

However, the approach of NEPA and similar legislation is to some extent putting the cart before the horse. Telling executive agencies that they should consider all relevant factors and all possible alternatives does not mean that they will be able to do so. We need not only a new approach, one of comprehensive systems analysis, but also new tools, such as a STA system.

The problems involved in establishing such tools are great, and once created would have considerable impact upon existent social, political, and economic decision-making theory. But the need is great. If we continue to assess our actions with partial information, we could find ourselves in a situation like the man who finally got to the top of the ladder and found it was leaning against the wrong wall.

Footnote

[1] Environmental Quality. The First Annual Report of the Council on Environmental Quality. August, 1970. U.S. Government Printing Office, p. 22.

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Some Impact
Assessment Dimensions

CONCEPTUALIZING ENVIRONMENTAL IMPACT

Paul Sager
Associate Professor
University of Wisconsin-Green Bay

The term, environment, is a most inclusive one. Problems associated with the analysis of Environmental Impact certainly have their origin in the all-inclusive nature of the term. In the same sense, a definition of Environmental Impact can be made only in a rather general sense unless one goes into the detailed array of factors and activities commonly observed in different matrix designs used to assess the effects of various actions on the environment. It seems likely that this detailed approach to assessment, if not evident already (USGS Circular 645), will be discussed later in this conference. Therefore, it appears permissible to pursue some thoughts of a more general nature on this question of: What is Environmental Impact?

Any activity which results in an alteration in the environment or in any of the components of the environment can be regarded as having an impact. Consequently the quantification of the alteration becomes the critical constraint. In light of the fact that the alteration may be manifest in any of many sets of factors, the question of norms or standards or guidelines becomes very obvious. Is there a normal or standard against which assessment of alterations can be made? Obviously in most cases there is little basis for an absolute scale of unaltered environmental parameters, but perhaps such a scale will ultimately be desirable. At present, alteration remains a relative concept. If the word damage is used in assessing impact, some precision is gained, although it still is a relative term. By analogy, temperature is a relative concept although it can be measured absolutely as well. It is possible for water of 35°F to be relatively warm to the touch when the air temperature is -10°F!

The critical question appears to be: When is the alteration to the environment serious enough to forestall or prevent any given activity? What should be the basis for assessing environmental impact? What are the critical parameters or concepts that should be included in an evaluation of possible alteration?

It appears to be premature to construct a framework of critical factors and associated value scales in the absence of a widely accepted philosophy of environmental values. Some thoughts on this consideration are within the admittedly narrow bounds of this paper.

Two areas of concern can be singled out for more serious thought on the problem of defining environmental impact. One is ecological in nature and the other is more human oriented. Both are guidelines that raise the question of long-term effects on man as an organism and on natural ecosystems which are an integral part of the biosphere and an integral part of man's existence.

Other generations will follow the existing ones. Decisions made today not only have an immediate effect on our society, but could also influence the quality of life for subsequent generations. Thus, environmental deterioration is much like genetic damage in organisms. It is an accumulative phenomenon that is a function of the many susceptible components of the environment. The type of damage that is most significant is that which does not allow for recovery but which is more or less permanent.

It is important for man as an evolving organism to maintain a perspective of his rather recent cultural development. It is important also to appreciate the momentum of the dominance, both biological and technological, that he has developed over a relatively short period of time. During the early stages of his evolution, man spent over 100,000 years adapted to a natural environment, genetically programmed to the sights, sounds, and odors of a natural landscape. And although the first significant alteration of the total environment began with the Industrial Revolution in the 1800s, the greatest impact of man's culture has probably occurred within the past 50 years. One must question the recent proliferation of steel, concrete, asphalt, and flashing lights in the context of effects on an organism that is removed only a few hundred generations from a drastically different environment.

Environmental impact, then, ought to be defined or evaluated on the basis of man's ability to tolerate or adapt, both physically and mentally, to the altered, artificial environment that is rapidly being created. It is difficult to determine if such a philosophy is presently being incorporated into the concept of Environmental Impact. It appears that we now consider only changes in the immediate physical environment. Man is too frequently excluded from the biotic component of the environment in assessment of impact. Yet, in terms of the high mobility of people, the transportation explosion, and the vast array of mass communication alternatives available today, man represents a very sensitive part of the biota. Local effects are important for local populations but, today, the likelihood of vast numbers of people encountering the alteration is very great. Environmental deterioration, in effect, can be multiplied and extended over large areas of the biosphere. The question of the temporal summation and spatial extension of effects thus appears to be critical enough for greater consideration in the assessment of environmental impacts.

A related consideration that comes to the forefront in the minds of ecologists and others is the value placed on the diversity of natural communities and ecosystems. Thousands of years have gone into the natural development of these areas. As such, they represent a heritage of great value, not only of ecological importance but also esthetic and psychological.

Ecologists see the value of diversity as a stabilizing element in nature. The diversity of plant and animal communities represents the basis for the "web of life." Stability in the natural component of the environment is intimately connected with what Aldo Leopold has referred to as the "health of the land." It is important that high priority for protection be given to the remaining patches of natural landscape. They afford opportunity for the additional studies that are needed for a more thorough understanding of the functioning of ecosystems and the establishment of base data on "normal," undisturbed components of the environment. Moreover, each biotic province needs its own undisturbed areas for this type of study and use. It is further suggested that diversity in the landscape performs an important esthetic and psychological role for man as a sensitive organism in the biosphere.

Included in the general philosophy which should be a basis for environmental impact analysis is the fact that the natural components of the environment represent integrated systems. The impact of various activities on the environment, then, must be assessed not in terms of isolated physical or biological or chemical factors but on the basis of effects noted or predicted for the total system. The impact of activity is generally a dynamic one, with ramifications in compartments other than the obvious ones. So the appraisal of impacts cannot be made statically. The environment represents a set of interconnected components and must be analyzed accordingly as an active, dynamic system. Disturbance of such complex systems are frequently detected at a point in time much later than at the time of initial impact.

In summary, it seems that guidelines are critically necessary for evaluating the question of when is an activity having or going to have a serious enough impact on the environment to justify curtailment of that activity. A precursor to the formulation of those guidelines might be the general acceptance of a philosophy of environmental values stressing the role of the natural landscape in maintaining an appropriate quality level of life for man in the biosphere. It appears to be particularly necessary to critically evaluate the need for any given development or alteration of the environment rather than assess the relative impacts of alternatives which will still meet the apparent need.

COMMUNICATING IN IMPACT ANALYSIS

Robert S. Cook
Associate Professor
University of Wisconsin-Green Bay

The word environment, its definition, and several ways of identifying points of impact have been quite adequately discussed. The question of how to recognize or determine significant environmental impact, and then, how to cope with it, are the two greatest problems facing us today. A crystal ball is needed! But, upon closer inspection, it appears that communication may be even more seriously needed.

The National Environmental Policy Act of 1970 has been hailed by many as one of the first acts of Congress that is forcing us into the necessary communication. It is usually much easier to talk about something than to put it in writing. Now, however, for the first time certain projects necessary for the benefit of society have to be evaluated in writing, then the evaluation must be circulated for review, and lastly, a final statement prepared describing how potential points of environmental impact will be handled. It looks like a good process, and the Council of Environmental Qualities "102 Monitor" gives long lists of such statements. However, the question of whether or not the content of these statements will really be significantly reflected in the actual projects remains to be seen. When the statements are not regarded as more homework, but as a useful tool to be used to give us a better environment, then progress will have been made. At this conference there are encouraging signs indicating this may happen.

The Environmental Impact Statement for Project Sanguine may not be typical but it is an interesting one. The draft statement dated March, 1971, says (p. iii) the final draft cannot be expected until several years hence because it will be based on environmental research results that will take time. "The goal of the Project Sanguine Environmental Compatibility Assurance Program remains to ensure that an operational ELF (Extremely Low Frequency) communications system, if designed and displayed, would be compatible with the environment."

In the Sanguine Project there are two major areas of impact: 1) that which includes the biological effects of the electromagnetic fields generated by the system, and 2) the installation disturbance to the countryside.

The first concern I must leave to the experts and many such persons are at work on the problem today. The second concern I can address myself to, and as one trained in wildlife ecology, I know the creation of "edge" in that kind of northern hardwood habitat would be very beneficial to wild populations, especially white-tailed deer, ruffed grouse, snowshoe hare and many small birds and mammals. But, therein lies the necessity for careful research on the electromagnetic effects on animals. Suppose research does reveal some subtle effect but the Navy concludes it is negligible because of the limited wild populations that now exist in the area. This conclusion could have a significant impact if the populations became concentrated in the disturbed areas, thus becoming vulnerable and hence serving as reservoirs of "slightly affected genetically" birds and animals. Consequently, the two major environmental impact concerns are quite closely intertwined.

The experimental results indicated in the draft environmental impact statement seemed to indicate that a number of areas require further investigation, e.g., soil invertebrates, bacterial response, fruit-fly mutagenesis, and seed germination. Predicting the environmental impact for this huge project is a costly, time consuming process for a project having a very debatable purpose.

Another concern that pertains to statement preparations has to deal with their content. A survey of environmental impact statements indicates that a special jargon is emerging. The category pertaining to "Land Resources Protection" contains such statements as ". . . would be preserved in their existing condition or restored to natural conditions after construction is complete."

-or "Water Resources Protection" contains such statements as "Construction contracts would include environmental stipulations preventing pollution of streams and lakes by fuels, oils, bitumens, calcium chloride . . . and by erosion after construction is complete."

-or "Protection of Fish and Wildlife" contains such statements as ". . . required to perform the work at all times according to environmental stipulations that prevent interference or disturbance to native fish and wildlife."

The above types of statements are hard to argue with and they put the agency preparing the statement on record as to just what they will do--or should it be intend to do? Being human and possessed with senses with which to perceive our environment, we are aware of the gap that usually exists between what is intended and what actually happens. Someone once said the "road to ruin is paved with good intentions."

We know it is impossible to "prevent interference or disturbance to native fish and wildlife" during most projects where they exist. Why not say, "attempts will be made to minimize interference or disturbance to native fish and wildlife?" At least be realistic in the preparations. In reality, what counts most is what happens if an okay is given and then an infraction occurs. Herein I feel lies a large problem, because it is the level of enforcement that makes the words in the statement become a reality.

The lack of a crystal ball puts the burden of responsibility squarely on our shoulders. We must solve our existing daily problems as well as plan ahead to circumvent others we can perceive on the horizon. What concerns me is how realistic are we? A healthy, thriving biological community is one in which much diversity exists. We humans seem to ignore this as our activities encourage the monotypic. When our village parks become clogged, we build bigger highways to "open areas." Then, as they become clogged, we go on from there. Granted, we cannot stop in time. We are a part of a dynamic biological community and therefore change is going to take place. We are all guessing about what we need in the future, but the guesses must be educated ones.

All the responsibility for resource management should not be placed on public agencies. People, local, county, state and federal governments, and industry, for example, are all pressure groups. Public agencies are obviously for the public, therefore they are very sensitive to public pressures. The need for progress usually results from the chance to make a dollar or from pressure--both are strong incentives. How the project for progress proceeds is the debatable issue concerning us today.

Should a city highway by-pass cut through a park, avoid the park but destroy the aesthetics of half of it, or go slightly further outside the city and avoid the park altogether? It sounds like a simple problem, but its solution depends on whether you belong to the city council who wants development in the area and a series of beltlines, or to that segment of the population who believes parks are more than ball diamonds, swings, and sandboxes, or a member of the highway department who must plan transportation routes and wants the most road for the least money and public confrontation!

In summary, decisions have to be made and people must make them. To be intelligent decisions they require careful considerations of past successes and mistakes, present needs and pressures, and future needs. Decisions today must be group decisions and input is needed from a diverse number of sources. This requires communication, which to me is one of the most necessary ingredients for the success of utilizing environmental impact analysis as a tool to be used in building a better society.

SOCIAL ASPECTS OF ENVIRONMENTAL IMPACT

Per K. Johnson
Assistant Professor
University of Wisconsin-Green Bay

I. Expansion of Concept

The concept of environmental impact ought to be expanded to include concerns for the social ramifications of any project under consideration. Questions should be asked such as: Will the project adversely affect the life styles of the residents nearby? Will it cause disruptions of well established behavior patterns of a substantial number of people? What will be the results in the social structures which exist in the area? With proper attention to these topics we can help assure that public projects will have a minimum detrimental effect on the social environment.

Let us expand these ideas a little further using an example. Consider a highway project through an urban area. The concerns for engineering, traffic control, and safety can easily be attended to. But what about the more intangible effects on the neighborhoods involved? How can they be measured? This is an almost impossible problem at the present stage of knowledge in the social sciences. The long-term effects of a major highway through a neighborhood are impossible to measure, and almost impossible to anticipate. But because these concerns do not lend themselves to measurement, they should not be ignored. In fact, they should receive the bulk of the attention, because by focusing on these things, we might discover indicators of disruptions of the social environment at an earlier stage. In connection with the present example, there is some research which can be applied.

Kevin Lynch at MIT has for a number of years conducted studies in the area of urban behavior. Specifically, his interest has been in the process by which we view the physical surroundings and the meanings certain locations acquire over time. This "image" of the city, as Lynch calls it, is an essential part of a person's development of a proper self identity. We form images of the settings we occupy and from these images we place ourselves in both space and in a social unit. From this develops a sense of place and belonging which the individual uses to aid in his identification with his surroundings. The characteristics of the image of the city that the person forms depend on the qualities of the setting. A small neighborhood which has distinctive qualities and is easily defined allows stronger feelings of identification than an amorphous area with characteristics and boundaries that are more difficult to define. As an example, in many cities the size of Green Bay, there are residential areas close to the heart of the city as well as rapidly growing areas surrounding the city. The research by Lynch supports my contention that the inner-city residential areas, with built-in variety and uniqueness lead to clearer images, a stronger sense of belonging and, hence, a more integrated self identity on the part of the residents than does the stereotype suburbia with its vast areas of sameness.

When considering the environmental impact of a project on a neighborhood it is vital to consider the qualities of that neighborhood which benefit its residents. A highway project through an urban residential neighborhood has the potential for causing severe disruptions in the process of the development of a sense of belonging among the people who will live in proximity of the road while not directly benefiting by its presence. By such a project the people who find themselves cut off from the rest of the city by a concrete barrier will also lose part of their feelings of affiliation with the city, which might, in turn, lead to anti-social behavior among the young in these physically alienated areas. We have witnessed the segmenting of our major cities by such construction and, without adequate data to document their effects, we may wonder about the long-term consequences on the residents who find themselves surrounded. Some of the worst mistakes of the past have come back to haunt us. The failure of the Pruitt-Igoe housing complex in St. Louis remains as a brutal public lesson concerning the consequences of ignoring some important social variables.

II. Definition of Social Variables

Let us now try to identify some of the social variables which ought to be considered in any environmental impact analysis. In spite of difficulties in measurement, these variables should, nevertheless, be attended to. First, and perhaps most important, there are concerns for the life styles and behavior patterns of the people to be affected. Some of the most obvious disruptions, such as physical relocation, noise, pollution, and traffic volume, can at least be quantified. But the puzzling questions arise when we are confronted by questions concerning the long-term effects of these on the life styles of the people involved. Will the project mean major changes in recreation patterns? Will it lead to alterations in pedestrian uses of the affected areas? What will be the effects on shopping habits, routes to school, or neighborhood social patterns.

Secondly, there is the elusive term, quality of life. There is little agreement on its meaning, yet the concern for its preservation is strong. As scientists and professionals concerned with the protection of the environment we must insure that projects of which we are a part do as little as possible to degrade the quality of life of the people affected. Quality of life might be operationally defined in terms of behavior patterns and life styles.

Finally, we can deal with what data might be available on attitudes and opinions. If the data is not there it can be collected. I will talk a little more about that at the end of my presentation. In order to ascertain the impact of a project on the social environment, we might ask people what they think of the potential alternatives. If it becomes clear that there is strong public sentiment against the completion of a particular project, it may be advisable to change the plans in accord with those sentiments.

III. Measurement

Now we come to the question of how to get the social data necessary to make enlightened decisions. I will in this connection briefly mention one line of studies which has led to tangible effects. I see the necessity of including some social science research in most environmental impact analyses. It will not be sufficient to sample the social winds and then, on the basis of these hunches, make decisions which will affect large numbers of people without suffering the consequences of what might be a disasterous decision.

What is called for is a systematic series of studies using one or more of the following techniques. The most straightforward approach is to sample the opinions of a random selection of the population involved in order to determine what the prevalent mood is. This can be done by either the direct interview technique using a trained interviewer, or by the use of questionnaires which can be distributed in a public place or mailed to the respondents. In either case, the information gained from the answers to carefully worded questions allows public officials to make decisions in the presence of some data. The best example in this area of research is a series of studies conducted by Claire Cooper in San Francisco and the Bay Area. In trying to evaluate present housing projects through the use of questionnaires, she not only obtained data on the residents' attitudes toward the present situation, but she provided information to the public authorities regarding user preferences which could be used in future projects. She studied three housing projects in the area, St. Francis Square, a downtown middle-income, garden apartment; Easter Hills, a lower-income, townhouse project; and Geneva Towers, a high-rise, lower-income development. She found that in the first and, to some extent, the second, the important social variables concerning needs for privacy, convenience, safety, and general habitability had been taken into account, and the results were that the residents were more satisfied, they stayed there longer, and they took better care of what they had while they were there. In the third case, the high-rise, there was a high degree of vandalism, quick turnover, and a general dissatisfaction with the surroundings. The impact of that social environment was, for the most part, devastating. Studies such as those of Miss Cooper are fairly easy to conduct and they yield valuable data for anyone attempting to analyze the effect on people of any public project.

There are a couple of other sources of information which ought to be used. The technique of simple observation is as old as scientific inquiry, yet it is too often overlooked when it comes to social research. If the question concerns the number of people who use a particular wilderness area a strategically placed observer can determine this easily. With that information, the decision can be made whether or not the area is suitable for the intended project. Observational techniques can also be used in urban areas. We are presently completing a study of the use patterns of selected urban parks in Green Bay with the objective of determining who uses these parks, for what purposes, at what times, and in what kinds of weather. This information will be fed to the local park and recreation department to be used in decisions concerning remodeling of present parks or the construction of new ones. What I am suggesting is that the use of observation can not only gain basic data on human behavior, but can be used as a feedback loop in the decision-making process in the design of the physical environment.

The final source of data I will mention is the wealth of information regarding social variables which is available through public records that are compiled for other purposes. Voting records, birth and death records, library records, and other public records contain information on the attitudes, preferences, and behavior patterns of the population. They are available to anyone.

What I have hoped to show is that there exist some vital social variables in environmental impact analysis which, if overlooked, can lead to unfortunate consequences. Many of these variables do not at present lend themselves to easy measurement, but we can do more in our concern with them. If man is also a part of the environment, then he has too often been the loser.

SOME THOUGHTS ON IMPACT STATEMENTS AND MATHEMATICS

Eugene Robkin
Assistant Professor
University of Wisconsin-Green Bay

"One look is worth a hundred reports." --Japanese Proverb

"So convenient a thing it is to be a reasonable creature, since it enables one to find or make a reason for everything one has a mind to do." -- Benjamin Franklin

The situation here neither requires nor permits detailed exposition, so I thought I might just provide a brief inventory of the mathematical techniques which I could find in use in those environmental impact statements available to me. Now it is true that these are a small sample of the impact statements that have been prepared, and it is true that conclusions drawn from such small unrepresentative samples are unreliable, but it is also true that of the statements I examined only one had any mathematics in it at all beyond elementary statistics and that one was not a formal impact statement. I am not counting as mathematics such statements as, "probably the following will be the case" which occurs in many of the statements. As it is used, that sort of phrase is a conventionalized replacement for, "in my opinion" at best and for, "it would be nice if the following were true" at worst.

As far as mathematics is concerned, the major preliminary difficulty with environmental impacts is that the problems are both ill-formulated and not readily quantified. In the absence of firm quantified standards for impact, mathematical analysis cannot deal readily with the question of, "is the impact sufficiently great to warrant termination of the project?" or "should the project be delayed while additional data is generated?" It is much easier to use uncertain data or non-quantified data to choose among alternatives which are qualitatively similar. That is, relative judgments are much easier than absolute ones.

I would like to provide a few warnings about the employment of mathematicians on problems such as this. You should not be surprised if a mathematician agrees to consider the problem offered and returns with a mathematical treatise with unidentifiable connections to the original problem. It is not surprising that an ill-formulated problem leads to an ill-connected solution. After all you have effectively hired a man to look for something without telling him what it is, or when or where you lost it. Like the drunk in the well known joke, he not only looks where he finds light, but he picks a part of town where he is comfortable, and he stops looking when he finds something that interests him. If you are lucky you will recognize some use for what was found. There is a possibility that the mathematics will be interesting and useful--to mathematicians.

What often happens in these cases is that in some areas the mathematics returns more than was expected and in some areas less than was expected. There is an example of what happens when a non-mathematics problem is delivered up to the tender mercies of the computer and the mathematician. In the early days of large computers there was considerable optimism about the use of computers for automated translation of languages. It was the failure of this optimism which has led to much more sophisticated views of language on the one hand and greater cleverness in the use of logic in computers on the other. One classic check on a translation is the double translation. A statement in English, for example, is translated to another language and then that statement, as an original input to the program is translated into English. The closeness of the second translation to the original English is, of course, a measure of your skill as a computer programmer and your understanding of the logical structure, if any, of the languages involved. The phrase selected for this particular trial was the good old English proverb "The Spirit is willing but the flesh is weak." After the double translation the new English rendering was, more or less, "The Vodka is OK but the roast is spoiled."

There is also a tendency to use those mathematical models and tools of analysis which yield results which are in agreement with a priori positions determined as acceptable before the analysis. While there is nothing inherently wrong with this process, it is dishonest to use the mathematical result as "proof" of the correctness of the a priori position. The circularity of this kind of argument is painfully obvious.

The second great difficulty in the application of mathematics to problems which are both as difficult as the impact problem and as ill-formulated as that, is the retreat to linear models and linear manipulations. A feature of linear relationships which is important here is the fact that small changes in one variable lead to small changes in others. Whatever you may mean by "small." It may come as a surprise to some, but I hope not, that the real world is simply not linear. Small changes do not necessarily lead to small effects. I am sure that you could all tell endless apocryphal stories about enormous fights waged over highway routes that were a foot too close to some uniquely dear tree and required its removal. Football games are often decided by fractions of an inch in the position of the ball or of some player. I do not recall who first used the following example but it is a good one. It is hard to imagine an event more trivial in a linear and stable world than the introduction of a diphtheria bacillus onto the mucous membranes of a human, or an event with such possibly cataclysmic results. Forcing environmental problems into the Procrustean bed of linearity will lead to fatal errors in any determination of absolute impact. It is less serious if the goal is a relative judgment between two closely related alternatives.

Along with the retreat to a linear world goes a retreat to a quantifiable one. It is too easy to emphasize in any analysis those factors which are quantifiable, and to ignore other factors which have not or perhaps cannot be quantified. You can see this in many highway route selection computer programs which emphasize costs, construction times, mileage, maintenance, numbers of bridges, and the like. The mathematician and the computer cannot yet, if ever, substitute for the kinds of political, moral, ethical, and biological determinations that you are being called on to make. "COMPUTER" is not a mystical synonym for "GOD."

You will note that the National Environmental Policy Act of 1970 in Section 102, Subsection C, part IV, requires that environmental impact statements address themselves to the relationship between local and short-term uses of the environment and long-term effects. I know of only one that attempts to do so. The other environmental impact analyses that I have seen, and I remind you that that is not a large number, make the tacit assumption that the future world will be the same as the present one. The future is dismissed with a figurative wave of the hand. This assumption may have some merit when dealing with the impact of a highway route through an established urban area, but I personally doubt it even for that situation. It is clearly wrong when the change itself acts as an attraction to further change. As Professor Eugene Odum has said ". . . an Interstate Highway is one of the most irresistible developmental magnets produced by man." To assess environmental impact for a development in an area of previously light development one must include some analysis of the impact in the longer term. There must be some attempt to deal with the future. I know of one analysis that makes a real attempt to do this. You may know of others. I am referring to a computer program for evaluating alternate highway routes proposed to fill in a gap in Interstate 75 near Atlanta, Georgia.[1] I do not think that a description has yet appeared in print. I assume that copies are available. You will note that this program dealt with a strictly relative problem. There were eight specific alternatives considered. The inclusion of the long-term effects in this program served to separate the proposed highway routes into relatively high and low impact categories. A test run with only present impacts accounted for, that is, ignoring the future, suppressed these differences. This one example suggests to me that the inclusion of long-term effects in environmental impact statements will prove to be an extremely useful tool for distinguishing the relative magnitude of effects.

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[1] *Optimum Pathway Matrix Analysis Approach to the Environmental Decision Making Process ---- Testcase: Relative Impact of Proposed Highway Alternatives*, Institute of Ecology, University of Georgia, Athens, Georgia, 1971.

95/96

Environmental Impact Assessment

SOME PROCEDURES AND PROGRAMS FOR ENVIRONMENTAL IMPACT ASSESSMENT

Jens C. Sorenson
Graduate Researcher
University of California-Berkeley

The problem of systematically relating the actions of a proposed project to possible changes of environmental conditions has been well recognized by agencies with responsibility for preparation or review of impact statements. The problem has been growing in recent months as new guidelines (by CEQ, the courts, or the agencies) have continued to expand the scope of environmental considerations that should be taken into account when preparing or reviewing an impact statement.

The first attempt to systematically relate project actions to environmental condition changes was the United States Geologic Survey's Circular 645, by Leopold and Hanshaw--which I believe most of you are familiar with. To my knowledge the USGS circular is still the only impact analysis published, although I hear that Battelle Institute has recently prepared a procedure for the Bureau of Reclamation, which I understand has had limited distribution.

According to USGS procedure, environmental impact can systematically be determined by using a matrix to show the relation of a project's action-activities to a comprehensive listing of environmental conditions that might be effected by the action-activities. The USGS procedure has proven to be of value on two counts. First, by providing the first comprehensive listing of factors that should be considered in impact statements. Secondly, by demonstrating to other agencies the possibility of factoring the environment into discrete characteristics capable of being analyzed for condition change. However, I foresee two major difficulties that agencies will have in the application of this procedure.

The basic problem is the inability of a simple matrix format to depict the network of interrelationships that actually develop between action (or cause) and the consequent environmental effects. It is well known that the environment operates as a complex system and can not accurately be characterized by direct cause and effect relationships. The actual system might more correctly be described as an impact network. That is to say, an action can cause one or more condition changes which in turn can each produce one or more subsequent condition changes before resulting in one or more terminal effects. An example might be highway-cuts or fills that would initially cause erosion of soil off slopes into streams, but which subsequently would increase stream turbidity, shoaling of water course, or alteration of stream channel regime. These in turn would increase stream flood potential, block passage of aquatic biota, or degrade stream habitat for aquatic biota.

In its present form the USGS can only indicate that a relationship between initial cause and terminal environmental effect exists but it does not indicate the nature of that relationship. For example, the matrix relationship between dredging and water quality might be due to turbidity or release of toxic minerals or could be attributable to several conditions. In order to describe the exact relationship the reviewer or proponent is advised to construct detailed matrices or give an explanation in the text of an accompanying report. The matrix in its present state of development is too ambiguous to show cause/effect relationships and therefore not of assistance in enabling the preparer to determine both how and what the changes in environmental condition will be. Likewise, unless the matrix relationships are explained, the reviewer of the impact statement will be unable to see how the relationships between project actions and environmental condition changes were determined. It appears that a person who could explain all the complex matrix relationships would not need to rely on the USGS procedure to write or review the impact statement.

A better method of relating project actions to environmental impact might be to use a cause-condition-effect network since it more closely approximates environmental interaction. One group--the California Comprehensive Ocean Area Planning Program--has applied this method of environmental impact assessment. The set of four sheets handed out show the system of impact networks developed to relate all the significant coastal resource uses to their known potential impacts on the coastal environment system. Most of the networks displayed were developed by relating known adverse coastal environmental impacts to the condition changes that produced them, and then tracing these condition changes back to project actions.

The present display format is read most easily by starting with "use" at the upper left corner and proceeding across and down to "causal factors" ("activities"). From there move down and across to "initial condition change," "subsequent condition changes," and "final effects." Adjacent to "effects" are columns for describing corrective actions or control mechanisms that might be employed to mitigate or eliminate the adverse effects identified in the preceding column. Such a listing of specific adverse effects and corrective reactions permits comparison to be made among project alternatives as to environmental impact either with or without corrective actions taken. The last column to the right was added to provide at least one specific reference to each cause-condition-effect network. References would serve several purposes. They would establish a degree of relevance in terms of actual site and time circumstances. That is, past known occurrences and what the network indicates as a possible future recurrence. References would also indicate the risk of an impact occurring on a particular location; more specific relationships between causes, conditions and effects; and procedures to avoid, minimize or correct the adverse impacts identified. One particular application of the network display is to act as information index--the statements and relationships are detailed enough to identify where specific information is available to describe the impact. However, the problem of extracting only the information relevant to the project has been encountered when actually using the network display. To correct this situation we are presently computer automating the networks. Computerization will allow us to easily add, delete, or correct the display according to new impact analysis information. I should comment that the network display is now fifteen months old and needs considerable expansion and some correction to incorporate new information that has come to light over that period of time (particularly social and economic information).

Computer automation will also allow portrayals of networks according to a project type or a specific project action. It will then be possible to have printouts for a particular project type or action; therefore, eliminating the tedious effort of manually tracing through the entire display each time a project is being reviewed. The capability of having impact networks displayed according to project type brings me back to my second criticism of the USGS matrix.

USGS has attempted to include on one sheet both the definitive listings covering virtually all project actions as well as all environmental conditions that could be impacted. The attempt to combine these two on one sheet has produced a matrix too cumbersome to work with because of its size but yet not specific enough to fully describe a project's actions or the resultant environmental conditions impacted. It appears to be far more practical to develop impact identification formats for each major project type.

Recently I made a survey of eight Federal Agencies that have the major responsibilities for preparing or reviewing environmental impact statements. The survey was conducted in the San Fransisco Bay region among the regional offices of the agencies. The purpose of the survey was to determine if the agencies had independently developed any environmental impact identification procedures. The survey results turned up only one impact review procedure that was nearing completion. The usual answer was "We are preparing such a procedure." Generally all that was presently available were administrative directives on how to process and route impact statements.

I can recommend to you the one impact identification procedure that I did find. It was prepared by the Environmental Protection Agency for review of sewage disposal projects. It is in the form of a checklist of environmental factors which may or may not be impacted by sewage plant location or change in operations. However, it still remains for the proponent of the sewage facility and EPA to determine how the actions associated with the operation may or may not relate to the environmental factors listed. The impact network methodology could be constructed to relate the actions normally associated with a sewage plant to the environmental factors listed by EPA. Once the networks are developed, it is possible to incorporate the information contained in them into specific project review guidelines. The coastal impact networks described earlier have been applied in this manner to develop specific coastal planning guidelines for county government.

One particularly commendable point about the EPA sewage plant review procedure is that it covers second level impacts or, more specifically, those dealing with changes in land use, conflict with the areas planning program, or development of open space generated by the new plant location or operation. To quote from their guidelines:

> "-To what degree will this project encourage residential or industrial growth that will result in a change of character of the area?
>
> -To what extent will undeveloped areas be sewered as a result of this and allied projects?
>
> -Is the project compatible with the type of growth desired by residents of the area?
>
> -Will the project conform to future land use planning?"

Projects, particularly those that are infrastructural; that is, sewage plants, water supply systems, highways, shipping channels, airports, railroads and rapid transit, will be required to comment on the environmental impacts of development that they will generate. The recent Federal Highway Administration guidelines for implementing the NEPA (Memorandum 90-1) are particularly explicit regarding consideration of a highway's "long term effects." They cite and I quote, ". . . foreseen changes in land use resulting from the highway improvement or other similarly related items that may either limit or expand land use, affect water, air, wildlife, etc., and other environmental factors." The memorandum also cites as an example of irretrievable commitment of resources, ". . . a highway improvement which provides access to a non-accessable area, acting as a catalyst for industrial, commercial, or residential development of an area." In preparation or review of impact statements, development generated by the project as well as the impact identification procedure must be evaluated. In many, if not most cases, it can be demonstrated that the impact associated with development so generated is greater in magnitude than the projects own, direct impact. This point has already been brought out several times in this conference.

It is quite apparent that future impact statements will have to consider a much larger scope of environmental issues as well as extend their coverage to social, economic and political considerations. To accomplish this all encompassing task with any degree of precision, agencies will have an even greater need to develop systematic impact identification procedures and give some order to the welter of environmental considerations possible. I would recommend that Federal Agencies develop an environmental impact identification procedure for each project type for which they are normally the proponent or reviewer. I would also recommend that the impact identification procedure consist of cause-condition-effect networks that would facilitate connection of project types specific actions to impacts known to have occurred in response to these specific actions. I would assume that the procedures would best be developed if the agencies that normally propose a project type collaborate with those agencies that have specific responsibility for reviewing the impacts associated with that project type. An example would be the Highway Administration requesting assistance from HUD in preparing networks describing the impact of highways on urban areas; or requesting EPA assistance in preparing network relationships between road cuts, fills and erosion impact on water bodies; or requesting from USGS, networks describing the effects of highway's impervious surfacing on stream flow peak discharge.

Judging from the record of project types listed in the "102 Monitor," impact identification formats are most needed for review of highways, impoundments, flood-control and stream channelizations, deep draft channels, water supply systems, sewage systems, power plants, airports, timber harvest, solid waste disposal, excavation, and mining. This enumeration adds up to eleven impact identification formats.

I would like to stress the point that the use of cause-condition-effect networks will only serve to identify the potential impacts that a project may generate and do not consider the actual environmental conditions that characterize the project location. In order to assess actual impact in a location context, the network identification of terminal effects must be related to the environmental conditions. We begin by asking, "What will be the intensity and distribution of changes in the actual conditions constituting the environmental system of the project area?"

This question brings me to the second part of this paper which is assessing the significance of possible environmental condition changes on the actual functioning of a region's environmental, social, and economic systems. This bears directly on the situation that environmental impact statements are rarely prepared in conjunction with any ongoing regional environmental planning or research programs. Generally this is due to the lack of comprehensive environmental planning programs. The proponent or reviewers impact assessment of how the project might change environmental conditions on a system-wide basis presently depends on sparse amounts of known environmental information or on a rush job of collected original information. Therefore, it can not be expected that an environmental impact statement will be comprehensively related to the regions environmental or social system. Because the environmental impact statement is presently conducted as an incremental exercise, and not as part of a comprehensive planning program, the impact assessment will fail to comprehend the threshold point where many apparently insignificant environmental conditions changes will reach a cumulative level that will result in irreversible degradation of one or more desirable environmental characteristics. As the saying goes, "We do not know our capabilities until we have exceeded them." What appears to be needed are regional environmental assessment and planning programs that will be able to integrate with and give comprehensiveness to the impact statement process.

Regional governments and associations that have been designated as metropolitan clearinghouses have the authority to review and comment on impact statements. These regional authorities are in a unique and extremely strategic position in respect to reviewing and passing comment on impact statements. Their regional perspective of environmental systems and their comprehensive planning orientation gives them the logical responsibility to function as environmental information centers. A regional perspective would also give them the ability to look at the projects total program as well as the individual project--to avoid the piecemeal problem mentioned yesterday. They should take advantage of this unique position.

There are a considerable number of regions in existence that are already conducting environmental planning programs and I would anticipate that many more areas in the United States will develop programs as the movement for regional comprehension of environmental systems gains acceptance and more states pass their own environmental policy acts. California and five other states have done so which brings to mind another question. Will the operation of state and federal environmental policy acts integrate or be a duplication of effort?

In California we are currently involved in setting up environmental planning programs for two regional associations and have just completed a planning program for a regional agency. Our experience with these regional organizations indicates that an effective environmental planning program should include the following programs:

The most basic and perhaps least difficult program to undertake would be the mapping of all known spatially definable environmental conditions that are likely to impact or be impacted by a region's probable project types. These environmental conditions are then categorized as either constraints to project development or environmental assets. Constraints are those conditions which either pose a hazard to project development or will be adversely impacted by the project (i.e. landslide-slump prone areas or areas of low air pollution assimilation capacity). Assets include desirable environmental qualities such as areas of exceptional scenic quality or productive wildlife habitats which should be protected against adverse impact.

Additionally, if environmental conditions were computer mapped, they could be quickly portrayed by a regional agency at the time a project is proposed. In essence, the condition mapping is intended to provide the capability of evaluating the relevance of the terminal effects from the impact identification procedure to the actual locational characteristics of the project. An example would be when the environmental impact identification procedure depicted salt water intrusion as a terminal effect of a project, and the environmental condition maps reveal that the project location area is over a ground water reservoir and includes a wetland wildlife habitat that would be intolerant of a salinity increase. The obvious conclusion would be that the project could have a significant salt water intrusion impact and should be studied in greater detail to more accurately assess the specific consequences.

Computer mapping of environmental conditions has also proven to be of value in depicting the scarcity or uniqueness of environmental assets such as indicating that an area is one of two in the region that has a scenic view, indigenous vegetation within 1/2 hour's access from the central city. Generally, the greater the uniqueness of an environmental asset, the greater would be the significance of an adverse impact upon it by a project's actions.

A second program is to study a region according to a land capability analysis. Land capability is the basis for regional comparison and evaluation of the sensitivity of the land to various kinds of condition changes (disturbances), the magnitude of impact, and the ability of the land to recover from such condition changes. The capability analysis is based on the information in the environmental condition mapping program just mentioned. The objective of land capability analysis is to distribute the coverage and intensity of environmental impact (i.e., percentage of impervious surfacing) on a region-wide basis in order to maintain a desirable level of environmental characteristic (lake clarity). Probably the most successful illustration of this procedure is the Lake Tahoe Region Plan. The success of the land capability analysis procedure at Tahoe is attributable to the strength of the impact network developed by impervious surfacing-erosion-sedimentation-lake discoloration and eutrophication. The main problem in applying capability analysis to regional planning has been the lack of quantitative information on the sensitivity of environmental conditions to project activities.

The lack of quantifiable information on environmental condition response to project actions relates directly to a third program for a regional environmental planning program.

A region should support research on environmental condition interaction in those resource systems particularly sensitive to degradation by the actions of potential projects. Investigation should also be made of the possibility of developing simulation models or other predictive devices that would indicate the relationship between a change in level of one environmental condition and the consequent impact on the entire environmental system.

A fourth program would be for the region, be it at the state, multi-county, or county level, to develop explicit policies for maintaining environmental values vis-a-vis social and economic considerations.

A regional planning program should be designed to have the ability of evaluating project alternatives, including the no project alternative. The consideration of the no project alternative has become a statement of why the project is needed. The statement of need is either a description of the projects benefits (such as employment tax base, economic growth, housing stock, recreational potential) or the projects costs if not allowed as (flood costs, highway congestion, higher power rates), I believe the question, "Do we really need this project--in respect to both the benefits described and the environmental impacts identified?", will become the dominant consideration in the impact statement review process. A regional planning organization should be able to comment on how the social-economic benefits or costs of project are compatible/incompatible with regional plans and policies. A particularly knotty question here will be to identify what sectors of society will be benefited or disbenefited by the project. If the regional planning organization decides that the project is desirable on social and economic grounds, then do these social and economic benefits outweigh the costs associated with adverse environmental impact. The problem then is to add up the environment costs, many of which, as we know, are subjective and not directly quantifiable. Here, I believe, the regional organization must play a key role by ascribing value criteria to subjective environmental qualities. The region should have adopted policies based on the broad expression of public interest in specific environmental qualities such as: keep Tahoe blue, keep agricultural lands in open space use, preserve endangered species. In the final analysis impact assessment will be a question of whether the net worth of protecting the threatened environmental quality values is at least equal to foregoing the benefits or incurring the costs of not allowing the project. This, as we have seen, is usually a political decision.

To end on a note of hard reality, I will say that no matter how much information or how many procedures are brought to bear in impact assessment, there will always be irreconcilable differences in values which can only be resolved in the political arena.

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EVALUATION OF ENVIRONMENTAL IMPACT THROUGH A COMPUTER MODELLING PROCESS

Thomas M. Krauskopf
Dennis C. Bunde
Graduate Researchers
Environmental Awareness Center
University of Wisconsin-Madison

The Environmental Awareness Center of the University of Wisconsin operates under the philosophy that concern for environmental impact should be an integral part of the planning and design process. Too often, environmental impact is considered only after location and design decisions are final. An impact statement, then, may serve only to justify the project and to mitigate criticism. Even if the statement is honest, and thorough, it becomes highly suspect.

A procedure is therefore needed which brings concern of environmental interaction into the policy-making and planning processes. The National Environmental Policy Act of 1970 requires, in part that:

> ". . . all agencies of the Federal Government shall
>
> A. Utilize a systematic interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision-making which may have an impact on man's environment;
>
> B. Identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations.
>
> C. Include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of human environment, a detailed statement by the responsible official on --
>
> (i) the environmental impact of the proposed action,
> (ii) any adverse environmental affects which cannot be avoided should the proposal be implemented,
> (iii) Alternatives to the proposed action,

> (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity and
> (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.
>
> D. Study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources . . ."

Beyond the requirements of the National Environmental Policy Act, the diversity and uniqueness of a resource and affects occurring beyond the immediate vicinity of the facility need to be considered within the context of environmental impact. The maintenance of diversity, whether biological, physical, or cultural, is critical not only to the continued functionings of ecological systems but to the fulfillment and psychological well-being of man as well. Impact upon a scarce resource is important not only because of potential loss of that resource but also due to the resultant decline in diversity of the system.

A new facility will often create environmental impact beyond the local zone of disturbance. For example, the construction of Interstate Highway 57 will require large quantities of sand and gravel. One of the probable local sources is a large esker. In the region, this is a unique sinuous glacial landform of aesthetic and scientific value. The esker has already been mined out over the majority of its length. A portion remains, where it cuts through a major wetland. Limited extraction has taken place. However, demand for highway construction materials would probably result in its total destruction. This type of resource needs to be identified and, if possible, protected. A proper highway environmental impact statement should make this clear.

The process, developed under the direction of Bernard J. Niemann, Jr., Associate Professor and Allen H. Miller, Assistant Professor, by the University of Wisconsin, Environmental Awareness Center and applied to the problem of locating an Interstate Highway, begins to fulfill these requirements.

The Regional Environmental Management Allocation Process (REMAP) applies existing computer technology in a way which: 1. brings the consideration of environmental impact into the primary decision-making process, 2. integrates multidisciplinary values and expertise, 3. makes the decision-making process explicit--allowing for documentation of the considerations or basis upon which decisions are made, and 4. compares quantitatively the impacts of the numerous alternative solutions.

REMAP is designed as a four-phase process consisting of:

1. Data Bank Development
2. Determinant Establishment

3. Alternative Representation
4. Alternative Analysis and Selection

Data Bank Development

Use of a computer storage system requires the relating of areas of uniform size and shape. For this reason, the Universal Transverse Mercator (UTM) projection was selected as the data reference and storage system, allowing data to be stored by the computer on a cellular basis.

Development of a data list is undertaken with the philosophy of building a varied data set which will allow for multiple variable combinations and interpretations affecting project location. Further, data selected is objective rather than interpreted (soils, for instance, are stored by type rather than suitability for a certain use). This allows data to be used in varied models.

The list of data chosen must be tailored to the region under study. A list derived for the mountains or deserts of the western United States will not be suited to the glaciated landscape of Wisconsin.

There is a potential to include listing of various landscape units. The natural landscape can be logically divided into units based on a hydrological hierarchy, resulting in classification of an area into major river basins, minor river basins, etc., and finally into watersheds or sub-watersheds. It is feasible to recall data on a unit basis. It would therefore be possible to analyze data for any given watershed unit or number of watershed units. Other unit manipulations can be made available based upon a cultural hierarchy including governmental units: counties, townships, etc.: education units: school districts; and regional planning units, to name a few. Potentially, data can be recalled and analyzed by unit, which would allow counties, governmental agencies or planning commissions to use a central data bank. Inter-agency sharing of data collection costs and use would assist units in planning more responsibly and economically.

Data listing alteration and refinement are continued throughout the extraction phase of the study. The establishment of the initial hierarchy allows for adjustment and addition without redundancy. This flexibility is an absolute necessity, since it allows the time-consuming process of data extraction to begin before the list of data-variables is finalized. The resultant structure is presented in outline form as follows:

VARIABLE LISTING STRUCTURE
INTERSTATE CORRIDOR SELECTION STUDY

NATURAL CHARACTERISTICS

1. Hydrological systems
2. Ecological systems
3. Physiographical systems
4. Pedological Systems

CULTURAL CHARACTERISTICS

1. Existing land use systems
2. Projected land use systems
3. Population distribution systems
4. Communications systems

At present the Environmental Awareness Center's data banks have utilized information extracted and stored on a per cent of cell or number per cell basis; utilizing a predetermined cell size. Cell size is determined by two factors: 1. the scale of the project decision to be made, and 2. the size of the variable patterns utilized--the cell size must be small enough to be sensitive to the changes in landscape patterns.

Under construction is a data bank in which variables will be stored by their patterns, upon which any appropriate cell size may be superimposed. Extraction and storage by pattern is especially well suited for the use of remote sensing imagery as a data source. Thermal scan imagery and highflight color and color infrared aerial photography are being used at present. In the future, imagery from Earth Resource Technology Satellites will be utilized.

Determinant Establishment

The second phase consists of construction of sets of factors which should influence the location of the facility under examination. Objectivity is, again, desired throughout the phase. A list of determinants is constructed by an interdisciplinary team made up of representatives of participating agencies. The establishment of determinants by an interactive agency process begins to meet the objectives of utilizing interdisciplinary inputs and providing multidisciplinary data.

In the case of REMAP, ten determinants have been selected which should influence highway location. These are based on concise, non-overlapping definitions.

Determinant List

1. Engineering Difficulty: A measure of compatibility between the landscape and highway design standards to minimize the engineering difficulty required to construct the interstate.

2. Cost of Construction: A measure of relative construction costs including structures, sub-grade preparation and special engineering problems to minimize financial investment.

3. Cost of Acquisition: A measure of relative cost coincident to the procurement of land for the right-of-way including land and relocation expenditures to minimize financial investment.

4. Projected Traffic Generation: A relative measure of potential traffic generated by projected urban and recreational centers.

5. Impact on the Cultural System: The disruption by the highway of residential units and incompatibility with existing and proposed land uses.

6. Impact on the Ecological System: The impact by the highway on the ecological system based on the ability of the resources to return to their previous state.

7. Impact on Quality Agricultural Land: The impact by the highway on potentially productive agricultural land based upon the capability of the land and its current uses.

8. Scenic Potential: The maximization of the landscape's potential to depict the rural Wisconsin scene at interstate designed speeds through identification of scenic resources and evaluation of the ability to see from the highway.

9. Impact on Recreation and Conservation Lands: The impact by the highway upon lands of potential recreational and conservation use based upon the inherent qualities of the landscape and its existing and proposed uses.

10. Development of Joint Communications Corridors: The maximization of potential development of a joint communication corridor based on the functional capabilities of the various communications networks.

Each determinant is represented by a linear model. Models are constructed through a series of steps. First, those data-variables which should influence each determinant are listed. Next, considering each determinant separately, variables are grouped by system type to form components. A component, therefore, consists of a group of variables which exert a like influence on the determinant. Finally, a weighting process is carried out.

The weighting process relies upon the experience of specialists to determine the relative influence of variables within the systems under consideration. Variables are weighted relative to their influence within a component. These weights are expressed as coefficients, which are generally applied to the per cent of the variable within a cell. However, in some cases the weight is applied to the number of occurrences of a variable within a cell--as in the case of the number of housing units.

The amount of influence of each component can be described either as a per cent of the total problem or as the magnitude of influence of the component relative to the other components in the determinant. The coefficient is applied to the derived component value. REMAP coefficients were applied placing greater weight on variables and components more restrictive to highway location. Variables favorable to highway location were weighted negatively. This results in the lowest value cells being the most favorable to highway location.

In order that subsystems of the modelling process may be interrelated, a normalization process was performed at each level to bring derived values to a uniform base. Normalization is applied on an "a priori" basis. Thus, consistency on both an inter- and intra-data bank basis may be obtained.

When completed and applied to the data bank, the determinant modelling process results in the creation of a spatial value surface for each determinant. This surface is stored by the computer and may be displayed in the form of a symbolic map of the study area. Highest value cells represented by the most dense print character indicate areas most restrictive to highway location under the criteria considered.

Alternative Representation

Continuation of the modelling process allows combination of the determinants to form alternative surfaces upon which an optimum location may be found.

Since the determinants reflect only specific location factors, it is necessary that they be combined. The same process is utilized to combine components into determinants.

How important each determinant is to the final location of a facility is a subjective decision as opposed to the relatively objective construction of determinants. The importance given each determinant will differ among individuals, interest groups, organizations, and agencies and represents a policy decision. Through weighting of the determinants, various strategies for alternative creation may be expressed. At this stage, opinions can freely interact with the process and the resulting value surfaces displayed for analysis.

Since each alternative is the end product of a linear model, a final coefficient for each variable in the system exists which takes into account the interaction of the determinants. This coefficient represents the actual influence of the variable upon the particular alternative model. Thus, documentation of which elements actually had the greatest influence upon any one alternative is possible.

Each cell value on the alternative surface represents the effective cost of a corridor affecting the entire cell. If the corridor affects less than the whole cell, then the effective cost is that fraction of the cell affected, times the cost of the entire cell. The total effective cost of a route is the sum of the costs for each of the individual cells affected.

Upon each alternative surface, a minimum route representing the least cost path between two points in terms of total values, may be located automatically. A program, called Line Finder, has been developed which uses dynamic programming to consider the effective cost of all possible corridors connecting two points, and then prints out the lowest effective cost corridor

Upon comparing the "line finder" routes with manually drawn ones for the same surfaces, it was found that the routes did not agree. There appears to be a difference in the concept of what was to be minimized. The program pays attention not to the cost of individual cells, but to the cost of the entire route. The human seems to try to avoid going through the high-valued cells. That is, when the human is given a choice between going through one high-valued cell and two lower-valued cells which have an aggregate value greater than the single high-valued cell, he tends to go through the two low-valued cells. The ecologist or naturalist can justify this strategy in the following way. It is important in locating a highway to save the ecological or natural resources. A cell containing either an extremely important natural or cultural resource, or containing a large number of lower valued resources, is subjectively more important than the additive weight of that cell.

The Line Finder was modified in order to try and simulate the human decision strategy. Values for each of the cells in each alternative surface were squared, and the regular route finder algorithm was applied. The agreement between the program generated line and the human one indicates that we have captured the essence of what the human is trying to optimize.

These routes conform closely to those drawn manually. The advantage of the automated line finder lies in its utilization of the actual values rather than the symbols on a map which represent ranges of value; also the automated system considers all possible routes to find the minimum.

Alternative Analysis

Any alternative route may be placed on any alternative or determinant surface and its effective cost found for that surface. How much a route deviates from the minimum possible route under a given set of criteria can then be obtained. Utilizing this technique it was possible to show that the routes put forward by the Wisconsin Division of Highways were responding primarily to construction cost and acquisition cost. With this procedure, it may be possible to find a route which deviates little from minimum cost for all of what are determined to be primary alternative surfaces.

To generate an alternative, a policy maker should be considering the relative importance of the cost of construction, the impact on the cultural system, the impact on the ecological system and the other determinants relative to the decision of highway corridor location. For each alternative created by the policy maker, a different optimum corridor will be generated by the Line Finder. This way of looking at the problem of corridor location is suitable for the designer, but not for the writer of the impact statement.

The purpose of the impact statement is to detail the effective costs for each corridor under consideration. A set of well-written impact statements, one for each proposed corridor, allows a decision maker to decide which corridor is best in terms of the public good and to defend that corridor.

Most of the data stored in the data bank for each cell, is in terms of per cent of cell occupied by that resource. For example, for a particular cell, 50% of the cell may be used for agriculture crops, 25% for livestock pasturage, 5% for town roads, and 20% for rural residential dwellings. In addition, 100% of the cell may be soil type B2, 75% of the cell may have a slope of 0-2%, and 25% may have a slope of 3-6%. The per cent of cell occupied by every resource is stored for each cell in the study area. These percentages can be converted to acreages. If given the exact location and width of a corridor, the fraction of every cell occupied by that corridor may be determined. From this information, the total acreage for each resource impacted by the corridor may be calculated. The impact statement for each corridor arrived at by this method is a quantification of the number of acres of agricultural crop lands, livestock pastural lands, rural residential land, etc., that will be impacted.

Any route or location, whether generated within the system or developed independently, may be stored by the computer and analyzed on the basis of resource impacted. Further, the resources which lie at any distance from a proposed route may be identified. The distance of impact extends beyond the right-of-way and the sensitivity on the resource may be considered. In this way it is possible to calculate to what extent resource systems lie within zones of various impacts.

The impact program has been utilized to quantify and compare the affects of various alternative interstate routes developed by the Environmental Awareness Center and the Wisconsin Division of Highways. A condensation of the analysis of these routes, which was presented at a public hearing in December 1971, appears in the supplements.

Supplement 1 shows the proposed routes. Routes 1 and 2 are routes from Saukville to Green Bay and routes 3, 4, and 5 use an existing route from Saukville to Sheboygan, and then connects Sheboygan and Green Bay.

Supplement 2 shows a summary of the land use for the five routes. The least expensive route is taken as a standard, and the other routes are shown as the per cent increase in cost over the standard. The impact width is 0.1 km, which is the width of the highway right-of-way. The impact of the highway is greater than just the land that it occupies, it also impacts adjacent land. The impact on this adjacent land can be found by running the impact program with a greater width. Supplement 3 shows a similar summary for the natural resources with an impact width of 1.0 km.

"Of importance is the increased impact to the natural resources. Corridor 3 of the Easterly Alternatives is both the shortest route and affects the least quantity of natural resources and is therefore used as the 'measuring stick.' Corridor 1 (a Center Alternative) from

Saukville to Bellevue, while being 60% longer, affects 229% more natural resources. Corridor 2 (a Center Alternative) somewhat shorter yet 50% longer than Corridor 3 affects 320% as many resources as Corridor 3. The use of U. S. 141 to Sheboygan, already to Interstate standards, as part of the Interstate system very clearly lessens impact due solely to the reduced length and need of additional construction. Corridor 4 (an Easterly Alternative), the westerly proposed corridor is only 3% longer than Corridor 3, yet it affects 54% more natural resources and Corridor 5, 9% longer, affects 69% more resources." Corridors 1 and 3 were developed through the REMAP process.

On the basis of a statement such as this, which quantifies the impact, one is in a position to: 1. decide whether the need for a highway is greater than its cost in terms of natural resources, and 2. to decide between different alternative corridors.

Environmental Impact Planning

The REMAP process is designed to be flexible. For this reason it may be applied to a broad spectrum of planning, location, resource allocation, and design problems. Once a data bank is constructed, it can be applied to any appropriate problem. In addition to being used to locate a highway, this process is presently being used to locate electric power transmission lines. On a demonstration basis, it has been used to locate new cities.

Model structure may be simple or complex. It is designed to solve a specific problem and its sophistication is determined by the user. Because of these characteristics, a data bank can be developed and has the potential of being utilized by several agencies working in the same region.

Summary

In summary, the REMAP process:

1. Integrates concern for environmental impact into the initial planning location process.
2. Integrates multidisciplinary values and expertise.
3. Provides an interdisciplinary data bank.
4. Allows for quantitative documentation of the consideration given each factor during each phase of the planning process.
5. Gives quantification of the influence of each variable upon the final model.
6. Allows for rapid development of alternative solutions.
7. Provides a means for rapid analysis of alternatives whether generated within the system or apart from it.
8. Provides quantification of the amount of resources impacted.

Supplement 1

PROPOSED CORRIDOR ALTERNATIVES

1 -- Saukville to Green Bay -- STH 57 + EAC
Central Refined (EAC)

2 -- Saukville to Bellevue (Division of Highways)

3 -- Sheboygan -- Ecological Consideration (EAC)

4 -- Manitowoc Alternative (Division of Highways)

5 -- U. S. 141 Modified (Division of Highways)

( ) - STH 57 Saukville to Split from EAC
Central Refined (Part of no. 1 above)

The originating agency follows the route name.

IMPACT WIDTH .1 km
QUANTITY IN ACRES

Supplement 2
A Comparison of Physical
Taking -- Land Use

RESOURCE	CORRIDOR ALTERNATIVES 1	2	3	4	5
Agriculture	2515.68	2346.68	1700.25	1704.22	1728 1
Institutional	4.46	1.53	4.48	3.45	6.47
Recreational/ Conservation	116.88	107.37	.60	.04	14.89
Industrial	6.26	4.20	2.70	1.53	6.03
Commercial	18.99	11.84	4.24	3.86	11.03
Urban	.10	.00	.07	2.57	11.50
Suburban	5.98	.74	2.47	1.62	5.30
Vacation	.54	.74	.00	.00	.00
Rural	.59	1.17	3.66	1.33	22.33
Barren Land	231.16	178.72	116.56	140.33	189.28
TOTAL	2900.64	2655.00	1835.40	1858.90	1995.30
% Increase	58%	45%	00%	1%	9%
Length in KM	(127.94)	(122.38)	(79.21)	(83.56)	(87.11)
Length in M	76.8	73.4	47.5	50.1	52.3
% Increase	62%	55%	00%	5%	10%
Mean Increase	60%	50%	00%	3%	9%

Supplement 3
A Comparison of
Significant Impact on
Natural Resources

IMPACT WIDTH 1 km
QUANTITY IN ACRES

RESOURCE	CORRIDOR ALTERNATIVES				
	1	2	3	4	5
Intermittent Streams	128.86	141.85	85.35	100.31	172.84
Streams	45.77	44.34	9.28	52.79	83.09
Minor River	94.70	89.08	10.52	14.85	20.93
Major River	29.98	4.95	.00	.00	.00
Pond or Lake Less than 50 acres	58.81	51.36	12.57	49.50	7.32
Lake	19.80	7.42	.00	.00	.00
Upland Forest	1962.54	2441.23	836.52	1307.04	1315.40
Lowland Forest	1526.56	2173.31	556.32	686.81	639.39
Open Swamp	235.23	294.17	64.23	135.49	81.06
21 + %	530.75	1076.67	184.10	374.27	540.95
Recreational/ Conservation	1174.95	1089.89	5.98	3.71	127.21
TOTAL	5807.95	7414.27	1764.87	2724.27	2988.19
Per Cent Increase	229.1%	320.2%	00%	45.4%	69%

Supplement 4

REMAP
DATA (VARIABLE) STORAGE

12 May 1971

000-099	LANDSCAPE UNITS
000-049	NATURAL UNITS
001	Watersheds
050-099	CULTURAL UNITS
050	Study Area
070	Counties
071	Townships
072	Corporate Limits
073	Extra-Territorial Limits
100-299	NATURAL CHARACTERISTICS
100-139	HYDROLOGIC SYSTEM
100	Watershed Order
105	Intermittent Streams
110	Streams
115	Minor Rivers
120	Major Rivers
125	Ponds
130	Lake - 50 acres
131	Lake
132	Fish Habitat
140-149	CLIMATOLOGICAL SYSTEM
140	Mean Annual Snowfall
141	Greatest Daily Precipitation
142	Number of Days 90°F or Greater
143	Number of Days 32°F or Less
150-199	ECOLOGIC SYSTEM
151	Upland Hardwoods
152	Hardwoods with Hemlock
153	Hardwoods with Conifers
154	White Pine
155	Popple with White Birch
156	Oak Hickory
157	Pin Cherry
158	Norway Pine
159	Birch
160	Swamp Hardwoods
161	White Cedar

162	Tamarack
163	Black Spruce
164	Balsam
170	Shrub Carr
171	Marsh
180	Red Cedar
200-249	PHYSIOGRAPHIC SYSTEM
200	Centroid Elevation
201	Center East Elevation
202	Center South Elevation
203	Center West Elevation
204	Center North Elevation
210	0-2% Slope
211	3-6% Slope
212	7-12% Slope
213	13-20% Slope
214	21% and Greater
250-299	PEDOLOGIC SYSTEM
250	Soil Association
261	Escarpment
262	Esker
263	Drumlin
300-499	CULTURAL CHARACTERISTICS
300-324	RESIDENTIAL SYSTEM
300	Residential-Rural
301	Residential-Recreation
302	Residential Suburban
303	Residential-Urban
310	Proposed Residential
315	Residential Units-Agricultural
316	Residential Units-Rural
317	Residential Units-Vacation
318	Residential Units-Suburban
319	Residential Units-Urban
325-349	COMMERCIAL SYSTEM
325	Commercial-Limited
328	Commercial-General
330	Proposed Commercial
340	Commercial Units
350-374	INDUSTRIAL SYSTEM
350	Industrial-Light
351	Industrial-Extractive
353	Industrial-Heavy

360	Proposed Industrial
370	Industrial Units
375-399	COMMUNICATION SYSTEM
375	Communication-Interchange
376	Communication-Air Field
377	Communication-Rail Terminal
382	Communication-Federal Highway
383	Communication-State Highway
384	Communication-County Highway
385	Communication-Local Roadway
386	Communication-Railway
387	Communication-Power Transmission Line
388	Communication-High Pressure Oil Line
389	Communication-Gas Line
390	Communication-Telephone Cable
391	Communication-Proposed Principal Arterial
392	Communication-Proposed Primary Arterial
393	Communication-Proposed Standard Arterial
394	Communication-Proposed Minor Arterial
395	Communication-Proposed Collector
400-424	INSTITUTIONAL SYSTEM
400	Institutional-Religious
405	Institutional-Medical Related
410	Institutional-Educational
415	Institutional-Governmental
420	Proposed Institutional
421	Institutional Units
425-449	AGRICULTURAL SYSTEM
425	Agricultural-Crops
426	Agricultural-Livestock
427	Agricultural-Fur, Game, Poultry
428	Agricultural-Plantation
429	Agricultural-
430	Agricultural-Platting
450-499	RECREATIONAL SYSTEM
451	Recreation-Wayside
452	Recreation-County Park
454	Recreation-Local Park
456	Recreation-State Forest
458	Recreation-Local Forest
460	Recreation-Organized Public-Private Activity
461	Recreation-Public Hunting or Fishing Grounds
462	Recreation-Wildlife Preserve
464	Recreation-Scientific Area
470	Recreation-Environmental Corridors
471	Recreation-River/Lake Zoning

472	Recreation-Scenic Easement
475	Recreation-Scenic Highways
480	Proposed Recreation
481	Proposed Scientific Area
482	Recreation-Intrinsic Resources/Wildlife
483	Recreation-Intrinsic Resources/Vegetation
484	Recreation-Intrinsic Resources/Physiographic
485	Recreation-Intrinsic Resources/Wetland
486	Recreation-Intrinsic Resources/Water
487	Recreation-Extrinsic Resources/Topographic Associated Structures
488	Recreation-Extrinsic Resources/Camps, Trails, and Accommodations
489	Recreation-Extrinsic Resources/Water Associated Sports and Facilities
490	Recreation-Extrinsic Resources/Winter Sports Facilities
491	Recreation-Extrinsic Resources/Publicly or Privately owned Land and Associated Clubs
492	Recreation-Extrinsic Resources/Water Associated Projects
493	Recreation-Extrinsic Resources/Wildlife and Conservation
494	Recreation-Extrinsic Resources/Historic Structure
495	Recreation-Extrinsic Resources/Historic Feature
496	Recreation-Extrinsic Resources/Cultural Structure
497	Recreation-Extrinsic Resources/Cultural Feature
499	No Discernable Use

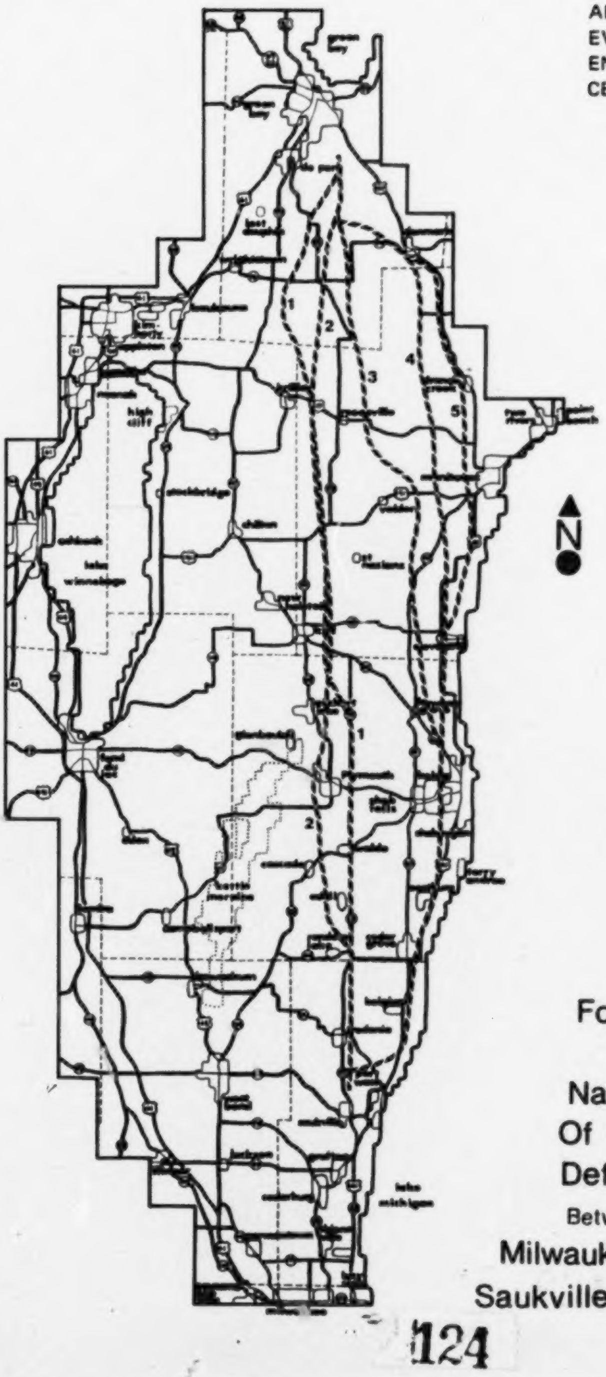
500-699 GENERATED DATA

500	Stream N-S Orientation
501	Stream NE-SW Orientation
502	Stream E-W Orientation
503	Stream SE-NW Orientation
504	Stream Random Orientation
510	Minor River N-S Orientation
511	Minor River NE-SW Orientation
512	Minor River E-W Orientation
513	Minor River SE-NW Orientation
514	Minor River Random Orientation
520	Major River N-S Orientation
521	Major River NE-SW Orientation
522	Major River E-W Orientation
523	Major River SE-NW Orientation
524	Major River Random Orientation
530	Stream - Without Game Fish
531	Stream - Trout
532	Stream - Small mouth Bass
533	Stream - Panfish
534	Stream - Walleye/Muskellunge
540	Minor River - Without Game Fish
541	Minor River - Trout

542	Minor River - Small mouth Bass
543	Minor River - Panfish
544	Minor River - Walleye/Muskellunge
550	Major River - Without Game Fish
551	Major River - Trout
552	Major River - Small mouth Bass
553	Major River - Panfish
554	Major River - Walleye/Muskellunge
560	Lake-50 Acres (-) Without Game Fish
561	Lake-50 Acres (-) Trout
562	Lake-50 Acres (-) Small mouth Bass
563	Lake-50 Acres (-) Panfish
564	Lake-50 Acres (-) Walleye/Muskellunge
570	Lake - Without Game Fish
571	Lake - Trout
572	Lake - Small mouth Bass
573	Lake - Panfish
574	Lake - Walleye/Muskellunge
580	Soil Suitability as Subgrade
581	Soil Erodibility Potential
582	Soil Productivity Potential
600	Highway Intersections
610	Federal Highway - N-S Orientation
611	Federal Highway - NE-SW Orientation
612	Federal Highway - E-W Orientation
613	Federal Highway - SE-NW Orientation
614	Federal Highway - Random Orientation
620	State Highway - N-S Orientation
621	State Highway - NE-SW Orientation
622	State Highway - E-W Orientation
623	State Highway - SE-NW Orientation
624	State Highway - Random Orientation
630	County Highway - N-S Orientation
631	County Highway - NE-SW Orientation
632	County Highway - E-W Orientation
633	County Highway - SE-NW Orientation
634	County Highway - Random Orientation
640	Railway - N-S Orientation
641	Railway - NE-SW Orientation
642	Railway - E-W Orientation
643	Railway - SE-NW Orientation
644	Railway - Random Orientation
650	Power Transmission Line - N-S Orientation
651	Power Transmission Line - NE-SW Orientation
652	Power Transmission Line - E-W Orientation
653	Power Transmission Line - SE-NW Orientation
654	Power Transmission Line - Random Orientation
660	High Pressure Oil Line - N-S Orientation
661	High Pressure Oil Line - NE-SW Orientation
662	High Pressure Oil Line - E-W Orientation
663	High Pressure Oil Line - SE-NW Orientation
664	High Pressure Oil Line - Random Orientation
670	Gas Line - N-S Orientation
671	Gas Line - NE-SW Orientation

672	Gas Line - E-W Orientation
673	Gas Line - SE-NW Orientation
674	Gas Line - Random Orientation
680	Telephone Cable - N-S Orientation
681	Telephone Cable - NE-SW Orientation
682	Telephone Cable - E-W Orientation
683	Telephone Cable - SE-NW Orientation
684	Telephone Cable - Random Orientation

ALTERNATIVE CORRIDORS
EVALUATED BY THE
ENVIRONMENTAL AWARENESS
CENTER



INTERSTATE
57

Corridors
For Location Of
The
National System
Of Interstate and
Defense Highway

Between the Cities of

Milwaukee and Green Bay
Saukville - Bellevue Section

THE QUANTITATIVE ASSESSMENT OF ENVIRONMENTAL IMPACTS

David Jowett
Associate Professor
University of Wisconsin-Green Bay

Introduction

In a number-oriented society such as ours there is little need to proclaim the importance of quantitative assessment in achieving insight into problems. But it is, I think, notable that the area of ecological impact has not so far been well served by numbers. More often than not, numbers have been used to raise, rather than lower, the emotional temper of debate. For example, irresponsible workers have quoted values of hundreds of thousands of births prevented by radio-active emissions, values which have certainly been arrived at in some cases by doubtful assumptions. However, perhaps some sense can be made of some situations some of the time by careful measurement, estimation and modelling.

Toxic Emissions

Until fairly recently, there was substantial agreement on what constituted safe quantities of toxic emissions. They should only represent a small fraction of naturally occurring levels. I would still adhere to this standard myself. Naturally occurring quantities can be surprisingly high. In the case of Mercury, Weiss *et al.*, (1) estimate the gaseous flux to the air to be between 2.5×10^{10} and 1.5×10^{11} g/year, or between 25,000 and 150,000 metric tons. By water the flux from the continents is a maximum of 3.8×10^{9}, much less. Estimates of gaseous release through human activities are: in chloralkali production, 3×10^{9} g; in cement manufacture, 10^{8} g; in roasting sulfide ores, 2×10^{9} g (2); in burning fossil fuels, 1.6×10^{9} (3). Most of this ends up in the ocean, where it will be concentrated through organic food chains because of the affinity of heavy metal for protein. But surprisingly enough the residence time in the ocean is rather short. Weiss *et al.*, (1) estimate the total mercury in surface waters to be 10^{12} g, perhaps not much more than 10-20 years production. Using figures of Cloud (4), the total mercury in the whole ocean is about 7×10^{13} g. If these figures are correct, then mercury must be disappearing rapidly into the bottom sediments. My purpose in quoting these figures is not to distract attention from locally serious mercury pollution, but to exemplify in modern form the old adage that "a man must eat a peck of dirt before he dies."

Of course, it is difficult for anybody to read of the effects of mercury poisoning and maintain his equanimity. But it must be done, for the hysterical approach will lead us to ruin. We might note in passing that mercury poisoning is certainly less common nowadays than 50-100 years ago, when many syphilitics (an astounding proportion of the adult population were syphilitic) suffered from it, and Sinclair (5) reports that New York hatters were particularly hard hit by prohibition, for they needed whiskey to control their shakes before starting work.

Similar figures can be quoted for other problem substances released through human activity. Woodwell et al, (6) present figures which indicate that only about one-fourtieth of one years U.S. production of DDT is present in the total world biomass, in spite of the capacity of life to absorb and retain this substance. The rest is sequestered in some way, and the amount in the biomass will decline rapidly if use of DDT soon ceases. In the case of nitrogen, Kohl et al, (7) estimate that for an Illinois watershed, not less than 55% of nitrate in surface water is derived from farmer applied nitrogen. This does represent a doubling or even tripling of natural levels on this rich farm land, but then nitrate is not really a very toxic substance. For phosphate, the amounts are probably much less because of the ease and rapidity with which phosphate is fixed in soil.

Finally, let us review the question of radiation damage. In a recent letter, Hull (8) states that the current rate at which the U.S. public is exposed to medical X-rays is about 2×10^7 rems/year, which is comparable to natural background radiation. On the other hand, 1969 standards for nuclear power plants imply 40 rems/year/plant, incomparably less. Yet this standard has been successfully challenged. Now of course we are frightened that radiation may "strike our children yet unborn and unbegot" by damaging their genetic endowment. But we should not strain at the gnat when we are prepared to swallow the camel. We are undoubtedly doing far more violence to our genetic future through the heroic efforts of medical science and welfare agencies to insure the reproductive potential of those unfortunate members of our society who are badly endowed genetically than ever we will do with radiation.

A problem with toxins is the idea of a safe dose. Recently, a leading toxicologist was quoted, somewhat disapprovingly, in Science to the effect that for every substance there is a lower level where it is innocuous, and an upper level where it is lethal. I find this statement unexceptional. A common way of assessing safe levels is to take the lowest level known to cause symptoms, and describe as safe one tenth (or even one hundredth) of that dose. The factors of ten and a hundred derive, one surmises, from the common observation that the distribution of death or damage in a population is approximately normally distributed if dose is measured on a logarithmic scale.

Problems of Measurement

I think we need to distinguish two classes of environmental impact, aesthetic and biological. Among aesthetic problems are the preservation of pleasing landforms, of ancient artefacts, and of rare but attractive species of plant and animal. The last is often proclaimed a biological problem, but it rarely is. Raven et al, (9) estimate that only about 10-15% of organic species are currently known to science, and of the remainder only 5% will become known before they become extinct through habitat destruction. It is in this light that I view the loss of the passenger pigeon with some equanimity.

Aesthetic judgments are susceptible to measurement. To indicate how this is achieved, I would like to introduce the scales of measurement commonly acknowledged by statisticians. These are nominal, ordinal, interval, and ratio. A nominal scale is simply a naming, where an item either possesses a property or it does not. The entries in the impact matrices of Jensen, discussed elsewhere at this meeting, are recorded on such a scale. An ordinal scale is one which places items in order, but with no suggestion that the difference between the first and second is of the same magnitude as that between the second and third. The Miss America finalists are measured on an ordinal scale. An interval scale does have the property that the intervals between numbers are constant, but numbers within these intervals are not defined. Thus if I flip a coin 9 times, I may get any integer number of heads between 0 and 9, but I cannot get 4.5 even though this is the expected number of heads. Note that an interval scale commonly results when nominal variables are summed. A rational scale is one on which all rational numbers are, in theory, achievable. A foot-rule is a simple example of such a scale.

Aesthetic judgments are at best ordinal. Note that this does not preclude fineness of scale (very fine judgments are achieved by judges at the Miss America pageant), nor statistical treatment. We can estimate agreement between ordinations, and discern differences. For a single individual or a well defined population, we can sum and average ordinations. Given enough data we might also begin to estimate the distances between points on the ordinal scale, thus approaching the informational content of a rational scale. But there is a difference, and if a person scores an object 1-10, he is using an ordinal scale, not an interval scale, and unfortunately his reference ordination is forever hidden in his own head.

This is no problem if everybody has the same reference scale, or if we wish to find some average for a well defined population. But for aesthetic judgments it is rare for either of these criteria to be met. Even for a single individual there is no constancy over time in aesthetic judgment. A tropic sunrise is very beautiful, but see very many and Kipling's imagery "An' the sun comes up like thunder" becomes a painful reality. Similarly, one may see Venice as an enchanting water wonderland or a stinking, fetid swamp. It depends a lot on how much money you have. In my native city of Liverpool there is an enormous neo-Greek pile of smoke blackened stone called St. Georges Hall, erected about 1840 by city fathers rich on slaves and cotton. A quarter century ago I was taught to despise it aesthetically as derivative, over-ornamented Victorian rubbish. I believe it is now the subject of a Government preservation order. Is it too great a step to the Lancashire colliery owner driving his guests to proudly view his spoil heap? "Where there's muck, there's money," they used to say. May we not again learn to take pride in the New York skyline, or admire the majesty of a lake-shore power station, suitably sanctified by a century of use?

Having expressed my reservations at the processes involved, let us consider techniques for translating such judgments into practical terms. Again I will distinguish two classes of problem--land use classification and planning permission. The first is the problem of deciding what class of activity should or should not be permitted over a certain area. The second is concerned with deciding, in a particular instance, whether an activity conforms with previously determined land use guidelines. Given authority to use ones own complement of ordinal scales, the first problem is tackled by making an exhaustive inventory of the resources of each area--scenic, agricultural, recreational, historic, etc. These are then mapped in such a way that areas richly endowed for specific uses emerge as different "colors." This necessitates differential weighting of resources, for if we apply too large a weighting to agriculture, then the map of Iowa, say, will come out all black for agriculture. But by adjusting the weights, shades of blackness will become apparent, rather like correctly developing a photographic print. Now the maps for different classes of use can be overlaid. An area very black for recreation but pale for agriculture would enable us to wash out agriculture as a primary land use. I do not wish to minimize the technical difficulties, but they do seem amenable to solution. However, the operator who creates the map is skillfully interposing his own value judgments at every stage of the process, although these value judgments may subsequently meet with popular approval. And if an area scheduled for recreation subsequently turns out to be sitting on a billion bbls. of oil, then the work must be done over for the inputs to the map have changed. Similarly, other additions and developments which are made to the landscape alter the map inputs. Such maps, or the data they incorporate, can be very valuable for one class of decision problems, exemplified by routing of a highway. Once it has been decided that two points are to be joined by a highway, computer techniques exist to route the highway in such a way as to minimize environmental impact. This seems first to have been done by McHarg. I would like to defer general consideration of planning permission until after reviewing my concept of the ecosystem.

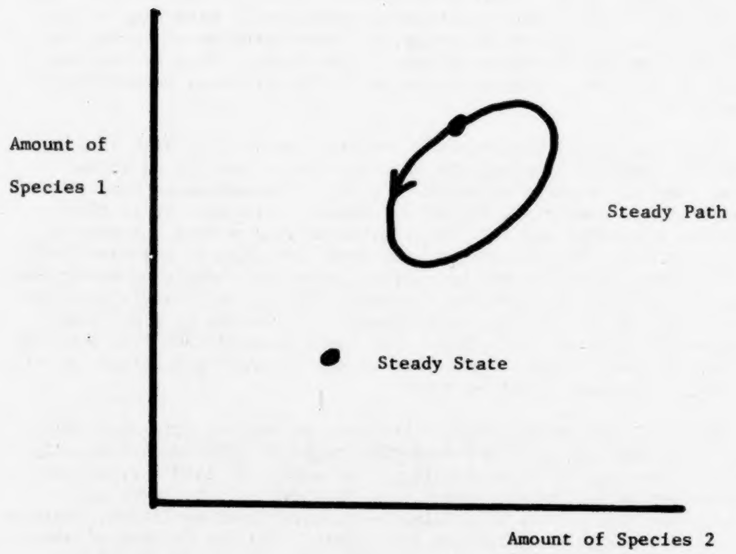
The Ecosystem

The word ecosystem, like democracy and freedom, is one of those useful terms which cover a multitude of instances. Planet earth is clearly an ecosystem, and so is a grain of soil. But any view of an ecosystem implies multidimensionality. We could consider an ecosystem as a concatenation of organisms, each present in a characteristic amount. Imagine each type of organism as represented by a rectangular axis in hyperspace. Then some point or path in that space represents a distinct ecosystem. A characteristic of ecosystems is stability. (For a more scholarly discussion of much of what follows, see Lewontin (10).)

I will illustrate what I mean by stability with reference to a two species system, (Figure 1). We have a two dimensional space spanned by two rectangular co-ordinates, each representing one of the species. Imagine this space as being occupied by a saucer shaped depression, and a particular ecosystem by an ordinary glass marble. Disturb the marble and it will roll back to its point of stability at the bottom of the saucer. Of course, disturb it too much, and it will roll off the edge of the saucer (generally into some other saucer shaped region of stability). Alternatively, there may be no stable point, but only a stable path. At any point in the depression, the

Figure 1

Conceptual View of the Ecosystem



marble is rolling to some other point, but the path it describes is smooth and unchanging. If disturbed from this path it will return to it, again unless the disturbance is so great that it enters a new stable path. Predator-prey relationships are of this type. Remember, though, that real ecosystems exist in multidimensional, not two dimensional space.

A benevolent environmental impact is one which does not permanently divert the marble from its appointed place or track. A truly malevolent impact sends the marble cascading down a track which includes no steady state, like Columbus sailing off the edge of the world. In between are moves into some new steady state, although we have a suspicion that each such move carries us closer to that fatal edge. However, I would state categorically that this was not the case for the pre-industrial degradation of the primordial British forest into grazing and arable. A new, more diverse, and many would consider a more beautiful, steady state was the result of that particular essay in environmental degradation.

Now this species system exists only in relation to another multidimensional system of environmental conditions--temperature, pH, moisture, nutrients, toxins, etc. It is changes in these conditions which impact on organismal stability. However, ecosystems are strongly buffered against such changes, partly by their ability to transform them, partly by their ability to move to a new steady state and partly by the considerable redundancy that exists in the species/niche relationship (see e.g. Harper (11). Ecological niches tend to be occupied by many species, and it is in this regard that biologically speaking, extinction of species is not too alarming, for other species occupying the niche will frequently expand to take up the slack. Each extinction, though, advances us a tiny step closer to the ultimate, irreversible degradation.

These two interacting systems are also interacting with at least two others, equally complex, the economic system and the political system. And it is clear to me that in these circumstances complete description and control is beyond our means. I believe it is fatal to attempt a careful and full description of what exists and what we are doing to it. The enormity of the task will lead to paralysis, of the kind sometimes expressed by Ehrlich, when for example he denigrates environmental clean-up with the statement "If you are traveling on the Titanic, you may as well go first class." If you are on the Titanic, the place to be is on the bridge. The iceberg could have been avoided if there had been a modest reduction in speed, and had a slight course correction been made a little sooner.

Statisticians are becoming accustomed to dealing with such multidimensional systems, and have evolved a range of techniques basically aimed at reducing the dimensionality. We generally find a great deal of intercorrelation in the system, and in these circumstances an adequate description can be obtained with much fewer variables. Perhaps a simple example will again make this clear. Imagine we have a large collection of a simple organism such as a clam. We may attempt to describe these clams by measuring length, breadth and thickness. If we now plot our data in a three-coordinate system, we will find that the points form a cigar-shaped form running from bottom left to the top right. The major axis of this ovoid represents the general factor of size, and the two minor axes very minor variations in shape.

Such simplifying single variables already exist for the systems we are discussing. Gross National Product is one, BOD is another. A third, for describing many species systems is the diversity index, D, derived from information theory

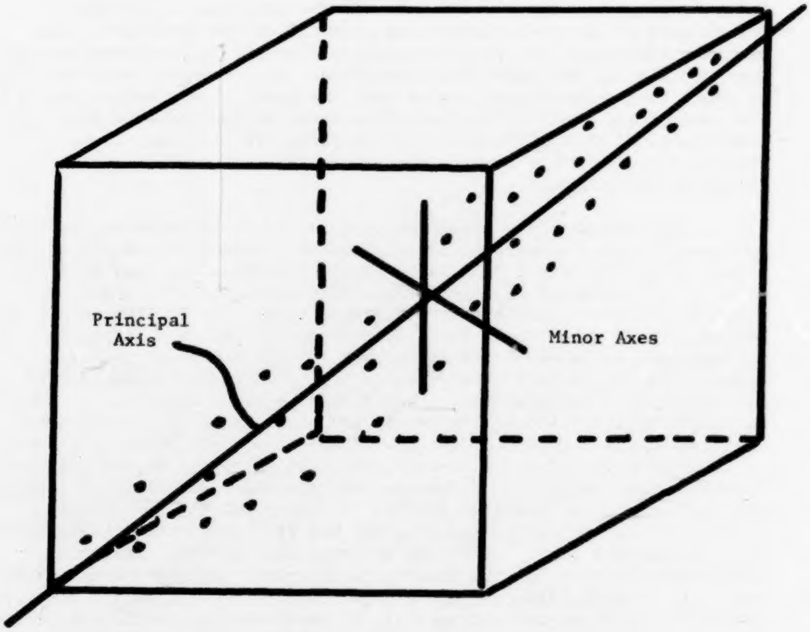
$$D = -\sum p_i \ln p_i$$

where p_i is the proportion of individuals of the ith species. This statistic gets larger as more and more species are equally represented, and declines as some species become rarer. For a fuller discussion, see e.g. Pielow (12).

I must hasten to point out that I do not consider these single variables to be a complete measure of the systems under study. They do, however, represent a lot of the variability, and fulfill the

Figure 2

Plot of Intercorrelated Data in Three-Space



requirement of paucity of parameters so beloved of scientists and so vital for decision makers. At present we do not have enough of these parameters, and we must redouble our efforts to find more. But it is interesting to me that the environmental problem closest to solution is water pollution, where BOD plays a critical part in description, and that political control of the economic process has been vastly improved in the last 40 years. In economics, a considerable array of good indicator variables is now available.

Environmental Impact Statements

The impact matrix of Leopold et al, (13) fails to meet my ideal criteria on two counts--impacts are measured on an ordinal scale, with no easy reference scale to which we can refer, and it is too big and unwieldy. It includes too much information to be readily absorbed, and because people differ so radically in their objective assessments it is difficult for me to see how thousands of these things can be usefully summed, averaged, arranged, and rearranged, to obtain some idea of overall impact of the multitudinous activities of mankind.

Indeed, it does seem to me that any such statement is likely to be most useful in forcing industrialists to consider the effects of their decisions on the environment. In the long run we may have to depend more on the intelligence and goodwill of the despoilers than upon the efficiency of the enforcers, much as the police depend on the good behavior of the bulk of the populace. In a worse-ordered society, we would hang a few despoilers to make the point clear, rather as, at the time of the American Revolution the British shot Admiral Byng for removing his inferior fleet of rotting ships out of range of the French, eliciting from Voltaire the remark that "they shoot one to encourage the others."

Legal apparatus has always existed to enforce such usage, and could be strengthened. Humpstone (14) has recently traced the origin of the suppression of nuisance from early common-law decisions, and it is a story of increasingly stringent restriction of activities which might earlier have been permitted in the common good. But he also points out the dangers of arbitrarily imposed, stringently enforced standards. If a plant manager is permitted to operate on a 2% emission standard, he spends money to do so at his peril if this standard may subsequently be unilaterally reduced, making his expensive plant obsolete. His best strategy, if the standard may be changed, is to fake it, or fight a delaying action through the courts. The British have forbidden noxious air pollution for almost a century, but only emissions beyond what is necessary are forbidden. Inspectors discuss the feasibility of control with polluters, and the law operates in such a way that an ancient, isolated plant may be permitted to pollute at a level totally unacceptable for a newer plant located in an urban environment. Amicable relationships exist between inspectors and plant managers, and only the most intransigent offenders are brought to court. With such a flexible procedure, in which the ultimate aim of zero emission is clearly stated, environmental impact statements might usefully represent evidence as to whether, within the limits of current technology the polluter has done (or has not done!) the best he can.

In simple situations, such as producing ICBM's and space research, techniques of operations research, using crude values such as form the entries of impact matrices, have been effective. It is noteworthy that in the area of international conflict, a more complex situation but still simpler than environmental protection, such techniques seem to have been an expensive failure. In making decisions under uncertainty, the possibility exists that there is no optimum decision. Truxall (15) outlines such a situation. A city mayor is faced with three possible strategies and must choose one.

A - Speed up traffic flow
B - Reduce air pollution
C - Improve garbage collection.

Analysis yields the following equiprobable results for A

a_1 - transportation improves	gain = +4
a_2 - no change	gain = 0
a_3 - more cars, more pollution, parking problems	gain = -1

Similarly for B and C

b_1	+1	c_1	+3
b_2	+1	c_2	+2
b_3	+1	c_3	-2

Now we compare A and B, and we have nine combinations to examine

$a_1 = 4$, $b_1 = 1$; $a_2 = 0$, $b_1 = 1$; $a_3 = -1$, $b_1 = 1$

$a_1 = 4$, $b_2 = 1$; $a_2 = 0$, $b_2 = 1$; $a_3 = -1$, $b_2 = 1$

$a_1 = 4$, $b_3 = 1$; $a_2 = 0$, $b_3 = 1$; $a_3 = -1$, $b_3 = 1$

Six out of nine times B is better than A. A similar comparison shows 6/9 times C is better than B. So clearly C is preferable. Unless one compares C with A, where 5/9 times A is better. This is a circular game, like the childrens game of stone, scissors and paper. There is no optimum strategy.

I am aware of having evaded several difficult problems. Land use classification I believe is achievable. Similarly, granted flexible approach, the reduction of noxious emissions of all kinds can be achieved, within the limits of current technology. But I am not optimistic about broad, overall control of activities, such as might be hoped for by utilizing environmental impact statements. The interacting systems are just too complex. In times of prosperity it is literally not possible to take decisions which might reduce that prosperity. In times of high unemployment, decisions that result in putting men back to work will be made without regard to environmental effects. Currently, so many people seem to want to adopt an adversary stance, us against them. But we are all them, or, in the immortal words of Pogo, "We have met the enemy and he is us." Cooperation in attaining stated, achievable, simple goals is, I suspect the best we can expect. We should concentrate on the formulation of such goals, and in the meantime we should regard with suspicion those who tell us at intervals that our doom is at hand.

References

1. Science 174, 692; 1971

2. Ibid.

3. Science 173, 233; 1971

4. "Resources and Man" NAS/NRC. p. 135, Freeman & Co., San Francisco, 1968

5. "Era of Excess," Harper Colophon, 1964

6. Science 174, 1101; 1972

7. Science 174, 1331; 1972

8. Science 174, 1280; 1971

9. Science 174, 1210; 1971

10. Brookhaven Symposium in Biology 22, 13: 1970

11. Brookhaven Symposium in Biology 22, 68: 1970

12. "Introduction to Mathematical Ecology," Wiley Intersciences, 1970

13. U. S. Geological Survey Circular, 645

14. Foreign Affairs 50, 325: 1972

15. J. Environ. Systems, 1, 77: 1971

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Concluding Remarks

NEPA: BUCKLING DOWN

Robert B. Ditton
Assistant Professor
University of Wisconsin-Green Bay

It would be difficult to imagine a conference focus any more timely than NEPA and environmental impact analysis methods. Changing guidelines and court decisions are daily stimuli requiring immediate responses by those involved in the development or review of impact statements. Consider, for example, the ramifications of the December 29, 1971 ruling by U.S. District Court Judge James E. Doyle in Milwaukee. He decreed that it is not the authority of agencies to decide whether an environmental impact statement must be filed under NEPA. Rather agencies must assemble statements for every project or else petition the court to determine if one is necessary. Many of you might suggest that Judge Doyle should have provided an "impact statement" with his decision. It all depends on how you view NEPA, its practicality, and its intent.

Development of environmental impact statements in compliance with Section 102 (2) (c) of NEPA can be viewed a number of ways. It can be viewed by agency officials as one more burden on already overburdened shoulders. It can be viewed as an intrusion on agency prerogatives. It can be regarded as a bottleneck to placate anti-development interests. Many have come to view it as a new bureaucratic paper shuffle. Others take it seriously.

NEPA was hailed as a landmark public law in 1970 because, at least on paper, it placed environmental concerns on a par with technologic and economic considerations. As such, a new ingredient has been added to federal decision making that will hopefully yield more sensitive decisions. Recognition of the value of this new ingredient will not come overnight nor will its implementation come easy.

We have devoted much of our conference program to exploration of the environmental impact analysis state of the art. In addition to presentations on technical methodologies, representatives of the U.S. Army Corps of Engineers and Federal Highway Administration spoke of "two years of labor and learning" based on their practical experience with NEPA. Further, we have sought to refine our concept of environmental impact to one that recognizes a greater number of aesthetic intangibles, that is more social science oriented and more relevant to an urbanized society.

As of November 30th, 1971, draft or final environmental impact statements on 2146 actions had been received by the Council on Environmental Quality. Recent discussions with Neal Orloff and Tom Winter in Washington reveal that these statements are literally arriving by the boxful.

Of equal importance is the fact that many agencies carrying on activities which significantly affect the environment have not reported environmental impacts in the recent past. With two years of implementation experience and a more sharply honed definition of "significantly affecting the environment," compliments of the courts, more comprehensive compliance can now be expected, hopefully, utilizing background information and methods presented at this conference.

Counting and weighing impact statements must give way to qualitative concerns. Effectiveness cannot be demonstrated in terms of the number of statements processed and environmental impact or lack of it cannot be measured by the boxful or the pound. The inexact methodologies we have available need to be improved, modified and refined if the intent of NEPA is to be met. In the meantime, we all have a responsibility to improvise with present methodologies, involve an array of disciplines in the development of statements, and foster a philosophy that will place high priority on guarding against environmental deterioration throughout our decision making.

At this conference we have sought to better understand NEPA's policy framework and its role in a larger government bureaucracy as well as methodological tools. Many would have us focus only on methodologies as if this was the one and only solution to our problems. It would be naive to believe that even with the most sharpened methods, the problems would be noticeably reduced. You must still live within the often restrictive boundaries of agency concerns, restrictive budgets, archaic laws and often archaic missions. We also recognize the motivation difficulties presented for specialists charged with assessing environmental impacts within the political arena as described by John Steinhart. We, therefore, felt compelled to deal with the larger policy framework if environmental impact analysis and methods were to have meaning.

Implementation of NEPA will have considerable impact of its own; either in the development of similar legislation and apparatus throughout government or in the rejuvenation of existing laws and agency responsibilities. Following in the footsteps of numerous public laws, NEPA is slowly shaping legislation and agency thinking on state and local levels. Already four states in addition to the Commonwealth of Puerto Rico have enacted laws directing state agencies to consider the environment in their actions. Environmental impact analysis procedures on the University of Wisconsin-Green Bay campus are in anticipation of NEPA-like legislation in Wisconsin.

A contrasting view is that the prediction of environmental impacts before they occur can also be carried out without creating a plethora of new agencies, laws and institutions, but by sharpening the effectiveness of present agencies and institutions. In speaking of this point, British Minister of the Environment, Peter Walker, notes that he expects his government's agencies to make environmentally sound judgements without decree or without employing the environmental impact statement mechanism:

> ". . . I personally think the environmental impact statement, like a number of other decisions in the past, really makes a land fit for lawyers to live in with no great impact upon the environment itself."[1]

While the National Environmental Policy Act of 1970 already guides Federal actions that may affect the environment, there are nevertheless a variety of institutional approaches open to state and local government for assessing their own environmental impacts.

Former Interior Secretary Stewart L. Udall spoke of a resource ethic for tomorrow in The Quiet Crisis. He said:

> "We can have abundance and an unspoiled environment if we are willing to pay the price. We must develop a land conscience that will inspire those daily acts of stewardship which will make America a more pleasant and more productive land."
>
> "Only an ever-widening concept and higher ideal of conservation will enlist our finest impulses and move us to make the earth a better home both for ourselves and for those as yet unborn."[2]

Tomorrow is today, which is why we are here today. And today we are discussing the potentials as well as the imperfections of the environmental impact analysis state of the art. Researchers at the University of Wisconsin and elsewhere have a responsibility for optimizing the potentials and correcting the imperfections. Universities and government agencies are encouraged to develop further conferences similar to this one but on a regional scale to arrive at new understanding of NEPA, its operationalization, as well as its rapidly changing legal and policy framework.

To implement current and updated methodologies, to improve them through experience, and to allow them to realistically guide your agency's development actions will require all the help and courage you can muster.

Footnotes

1. Sally Lindsay, "Conversation with Britain's Environmental Chief," Saturday Review (55) 1, 70.

2. Stewart L. Udall, The Quiet Crisis (New York: Holt, Rinehart and Winston, 1963), pp 190-200.

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Appendices

APPENDIX A

Public Law 91-190
91st Congress, S. 1075
January 1, 1970

AN ACT

83 STAT. 852

To establish a national policy for the environment, to provide for the establishment of a Council on Environmental Quality, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Environmental Policy Act of 1969."

National Environmental Policy Act of 1969.

PURPOSE

SEC. 2. The purposes of this Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.

TITLE I

DECLARATION OF NATIONAL ENVIRONMENTAL POLICY

Policies and goals.

SEC. 101. (a) The Congress, recognizing the profound impact of man's activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth, high-density urbanization, industrial expansion, resource exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental quality to the overall welfare and development of man, declares that it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.

(b) In order to carry out the policy set forth in this Act, it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may--

(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

(2) assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;

(3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

(4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice;

(5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and

(6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

(c) The Congress recognizes that each person should enjoy a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment.

Administration.

SEC. 102. The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall--

(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;

(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on--

(i) the environmental impact of the proposed action,
(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
(iii) alternatives to the proposed action,
(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of the long-term productivity, and
(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of title 5. United States Code, and shall accompany the proposal through the existing agency review processes;

Copies of statements, etc.; availability.

81 Stat. 54.

(D) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;
(E) recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment;
(F) make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;
(G) initiate and utilize ecological information in the planning and development of resource-oriented projects; and
(H) assist the Council on Environmental Quality established by title II of this Act.

Review

SEC. 103. All agencies of the Federal Government shall review their present statutory authority, administrative regulations, and current policies and procedures for the purpose of determining whether there are any deficiencies or inconsistencies therein which prohibit full compliance with the purposes and provisions of this Act and shall propose to the President not later than July 1, 1971, such measures as may be necessary to bring their authority and policies into conformity with the intent, purposes, and procedures set forth in this Act.

SEC. 104. Nothing in Section 102 or 103 shall in any way affect the specific statutory obligations of any Federal agency (1) to comply with criteria or standards of environmental quality, (2) to coordinate or consult with any other Federal or State agency, or (3) to act, or refrain from acting contingent upon the recommendations or certification of any other Federal or State agency.

SEC. 105. The policies and goals set forth in this Act are supplementary to those set forth in existing authorizations of Federal agencies.

TITLE II

COUNCIL ON ENVIRONMENTAL QUALITY

Report to Congress

SEC. 201. The President shall transmit to the Congress annually beginning July 1, 1970, an Environmental Quality Report (hereinafter referred to as the "report") which shall set forth (1) the status and condition of the major natural, manmade, or altered environmental classes of the Nation, including, but not limited to, the air, the aquatic, including marine, esturine, and fresh water, and the terrestrial environment, including, but not limited to, the forest, dryland, wetland, range, urban, suburban, and rural environment; (2) current and foreseeable trends in the quality, management and utilization of such environments and the effects of those trends on the social, economic, and other requirements of the Nation; (3) the adequacy of available natural resources for fulfilling human and economic requirements of the Nation in the light of expected population pressures; (4) a review of the programs and activities (including regulatory activities) of the Federal Government, the State and local governments, and nongovernmental entities or individuals, with particular reference to their effect on the environment and on the conservation, development and utilization of natural resources; and (5) a program for remedying the deficiencies of existing programs and activities, together with recommendations for legislation.

Council on Environmental Quality.

SEC. 202. There is created in the Executive Office of the President a Council on Environmental Quality (hereinafter referred to as the "Council"). The Council shall be composed of three members who shall be appointed by the President to serve at his pleasure, by and with the advice and consent of the Senate. The President shall designate one of the members of the Council to serve as Chairman. Each member shall be a person who, as a result of his training, experience, and attainments, is exceptionally well qualified to analyze and interpret environmental trends and information of all kinds: to appraise programs and activities of the Federal Government in the light of the policy set forth in title I of this Act; to be conscious of and responsive to the scientific, economic, social, esthetic, and cultural needs and interests of the Nation; and to formulate and recommend national policies to promote the improvement of the quality of the environment.

SEC. 203. The Council may employ such officers and employees as may be necessary to carry out its functions under this Act. In addition, the Council may employ and fix the compensation of such experts and consultants as may be necessary for the carrying out of its functions under this Act, in accordance with section 3109 of title 5, United States Code (but without regard to the last sentence thereof).

80 Stat. 416.

Duties and functions.

SEC. 204. It shall be the duty and function of the Council--

(1) to assist and advise the President in the preparation of the Environmental Quality Report required by section 201;

(2) to gather timely and authoritative information concerning the conditions and trends in the quality of the environment both current and prospective, to analyze and interpret such information for the purpose of determining whether such conditions and trends are interfering, or are likely to interfere, with the achievement of the policy set forth in title I of this Act, and to compile and submit to the President studies relating to such conditions and trends;

(3) to review and appraise the various programs and activities of the Federal Government in the light of the policy set forth in title I of this Act for the purpose of determining the extent to which such programs and activities are contributing to the achievement of such policy, and to make recommendations to the President with respect thereto;

(4) to develop and recommend to the President national policies to foster and promote the improvement of environmental quality to meet the conservation,

social, economic, health, and other requirements and goals of the Nation;

(5) to conduct investigations, studies, surveys, research, and analyses relating to ecological systems and environmental quality;

(6) to document and define changes in the natural environment, including the plant and animal systems, and to accumulate necessary data and other information for a continuing analysis of these changes or trends and an interpretation of their underlying causes;

(7) to report at least once each year to the President on the state and condition of the environment; and

(8) to make and furnish such studies, reports thereon, and recommendations with respect to matters of policy and legislation as the President may request.

SEC. 205. In exercising its powers, functions, and duties under this Act, the Council shall--

34 F. R. 8693.

(1) consult with the Citizens' Advisory Committee on Environmental Quality established by Executive Order numbered 11472, dated May 29, 1969, and with such representatives of science, industry, agriculture, labor conservation organizations, State and local governments and other groups, as it deems advisable; and

(2) utilize, to the fullest extent possible, the services, facilities, and information (including statistical information) of public and private agencies and organizations, and individuals, in order that duplication of effort and expense may be avoided, thus assuring that the Council's activities will not unnecessarily overlap or conflict with similar activities authorized by law and performed by established agencies.

Tenure and compensation.

80 Stat. 460, 461.

81 Stat. 638.

SEC. 206. Members of the Council shall serve full time and the Chairman of the Council shall be compensated at the rate provided for Level II of the Executive Schedule Pay Rates (5 U.S.C. 5313). The other members of the Council shall be compensated at the rate provided for Level IV or the Executive Schedule Pay Rates (5 U.S.C. 5315).

Appropriations.

SEC. 207. There are authorized to be appropriated to carry out the provisions of this Act not to exceed $300,000 for fiscal year 1970, $700,000 for fiscal year 1971, and $1,000,000 for each fiscal year thereafter.

Approved January 1, 1970.

LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 91-378, 91-378, pt. 2, accompanying H. R. 12549
(Comm. on Merchant Marine & Fisheries) and 91-765
(Comm. of Conference).

SENATE REPORT No. 91-296 (Comm. on Interior & Insular Affairs).

CONGRESSIONAL RECORD, Vol. 115 (1969).

July 10: Considered and passed Senate.

Sept. 23: Considered and passed House, amended, in lieu of H. R. 12549.

Oct. 8: Senate disagreed to House amendments; agreed to conference.

Dec. 20: Senate agreed to conference report.

Dec. 22: House agreed to conference report.

20 QUESTIONS AND ANSWERS EXPLAINING THE NEPA SECTION 102 ENVIRONMENT IMPACT STATEMENT PROCESS*

Q: 1. What is a "102 statement"?

A: It is a detailed analysis of environmental aspects of proposed action which all Federal Government agencies are required to prepare and use in their agency review processes before they take any "major actions" (including recommendations and reports on legislation) which "significantly affect the quality of the human environment."

Q: 2. Why is it called a "102 statement"?

A: Section 102, in particular 102 (2) (C), of the National Environmental Policy Act ("NEPA") (Public Law 91-190, 91st Congress, January 1, 1970, 42 U.S.C. Sec. 4332 (2) (C)) created the requirement for the statement, and set forth the procedure to be followed in its preparation and the topics it must discuss:

(i) The environmental impact of the proposed action
(ii) any unavoidable adverse effects
(iii) alternatives
(iv) the relationship of short-term uses and long-term productivity
(v) any irreversible and irretrievable commitments of resources.

The Council on Environmental Quality has issued Guidelines on how agencies are to meet this requirement (36 Federal Register 7724, April 23, 1971) and most agencies have set up procedures applying the requirement to their own programs.

Q: 3. Who prepares 102 statements?

A: The law says only that it shall be prepared by "the responsible official". Agencies are currently working to prepare final procedures for making their particular operations accord with the Act, and each agency's procedures identify which official must issue 102 statements.

Q: 4. Do agencies of State Government have to prepare these statements?

A: Unless the State requires this under its own law, States prepare statements only when their actions are supported by Federal contracts, grants, or permits, and the Federal agency procedures have delegated initial preparation of statements to the state level.

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* From: "102 Monitor" Published by the Council on Environmental Quality. 722 Jackson Place, N.W., 20006. Volume 1, Number 10, November 1971.

An example is the Federal Highway Administration, which provides matching grants for many state highway construction programs. The draft statements here are generally prepared by the State Highway Departments; the Department of Transportation takes responsibility for the final statements.

Q: 5. Must industry prepare 102 statements?

A: Generally speaking, no. The exception comes when an industry action requires a Federal license or permit -- such as a Corps of Engineers dredging permit, a transmission line right-of-way across Federal land, or Federal Power Commission license for a dam.

When a Federal regulatory or permit action calls for a statement, the Federal agency will still prepare the environmental statement, but may require the private industry proposing the action to file a preliminary environmental report analyzing the environmental aspects of what it proposes to do.

Q: 6. What if two or more agencies are involved in the same project?

A: One is chosen to be the "lead" agency and made responsible for the environmental impact statement.

Q: 7. How large must a project be before it is considered a "major action" with "significant impact"?

A: Again, this varies from department to department, as each applies NEPA to its own activities and problems. The CEQ Guidelines (Section 5 (b)) indicate that "highly controversial" actions are to be covered, as well as decisions taken over a period of time which, though individually not major, have a "cumulatively significant impact."

To note some examples, the Corps of Engineers' proposed final procedures (Federal Register, June 11, 1971) call for statements not only on the Corps Water Resource Projects but also on "leasing of project lands for industrial uses, requests for overhead rights-of-way, mineral extractions such as sand, gravel, rock, etc . . ."

The Federal Power Commission's proposed regulations (36 Federal Register 13040, July 13, 1971) place the cutoff line for hydroelectric projects at 2,000 horsepower; above that, regulation involves a major action, while below it does not.

Q: 8. When are statements prepared?

A: The Council's Guidelines indicate that they must be made "early enough in the agency review process before an action is taken in order to permit meaningful consideration of the environmental issues involved" (section 10 (b)). In addition, the "action-forcing" 90 day waiting period requirement (see Q #17) means that the Federal Agency considering a project must anticipate a minimum ninety day wait from filing the draft statement to beginning action.

Q: 9. How many 102's does the CEQ receive in a month?
How many since enactment of NEPA?

A: The November 1971 Monitor listed 101 draft and 95 final statements, for a total of 196 of which over half related to highway construction. Since enactment of the National Environmental Policy Act on January 1, 1970, almost two thousand draft and 850 final statements have been catalogued, covering a total of 2040 actions (including legislative proposals and reports) subjected to environmental analysis under the Act.

Q: 10. What is the difference between a "draft" and a "final" statement?

A: The CEQ Guidelines require that each statement be prepared in two stages: first, the sponsoring agency prepares a draft statement using its own expertise and information. The draft is then reviewed and commented on by other agencies which have specialized expertise relating to the project. Finally, the sponsoring agency uses these comments to modify the project plans (if indicated) and to prepare a final statement.

Q: 11. Who is asked to comment?

A: The Guidelines contain an appendix which lists Federal agencies with expertise in particular aspects of the environment which should be asked to comment. In addition, when State or local review is relevant, copies of the draft are either sent to the state, regional, and metropolitan clearinghouses set up by Circular #A-95 of the Office of Management and Budget or directly to State and local agencies authorized to develop and enforce environmental standards. The CEQ receives ten copies of every statement and may also comment.

Q: 12. What role do members of the public have in the commenting process?

A: The agency preparing the draft statement is responsible for making it available to the public (under the Freedom of Information Act (5 U.S.C. Section 552) — see Q #18). Any individual or organization may then comment on the draft; he may express support or opposition, suggest alternatives, or point out project effects that may have escaped the attention of its sponsors. These comments may be in the form of a letter, a critique, or even, as done by some citizen's groups, a "counter-102" setting forth their views and analysis in as great a depth as the draft itself.

Q: 13. How soon must comments be made?

A: Ordinarily agencies must allow at least thirty days for comments (forty-five for EPA comments on projects with effects in the areas of EPA jurisdiction). Some have written longer periods into their procedures. The Guidelines suggest that requests for 15 day extensions should be considered favorably.

Q: 14. How can people find out about comments?

A: The summary sheet attached to each draft statement lists the agencies consulted; the final statement is made available with copies of all comments received. The sponsoring agency is responsible for making comments available on request (under the Freedom of Information Act); such request should be directed either to the sponsoring agency's nearest regional office, or to its environmental liaison officer (listed in Appendix II of the Guidelines).

Q: 15. How can the public get copies of statements and comments on such statements?

A: All draft and final statements, unless classified are listed in the 102 Monitor; since May they have been given a NTIS (National Technical Information Service) order number, and since August, an ELR (Environmental Law Reporter) order number. (see p. 8 for information on how to order the statements from NTIS or the Environmental Law Reporter). It is particularly important to a prompt response that the order number be sent to NTIS.

Copies of statements are also kept at the offices of the agency that prepared them, as well as being available to the public at the State and regional clearinghouses (see Q #11).

Representatives of conservation groups who feel that they will want to comment on many of an agency's statements should contact either the nearest regional office or the agency's environmental liaison official (see Q #14) with the request that their names be added to the mailing list for commentators.

Q: 16. Is there any other way to involve the public in project review?

A: Yes — the public hearing. Some agencies (e.g., the Federal Highway Administration) are required to hold them as a matter of statute, while others are encouraged by Executive Order 11514 to hold them as a point of contact with public opinion. For non-regulatory hearings, the draft statement must be made available fifteen days in advance of the hearing.

Q: 17. What chance is there for the draft and final 102 statements to affect agency action?

A: CEQ's Guidelines Section 10 (b) provides that "to the maximum extent possible" no administrative action is to be taken within 90 days after the draft statement has been made available to the Council and the public, nor is it to be taken within thirty days of the final statement's availability (the time periods may overlap). In other words, an agency cannot start work until the public and the Executive have had at least 90 days to examine the environmental consequences of the plan — and if the final follows the draft by more than 60 days, the review time is extended as well.

These waiting periods only apply to actions the agency can take itself — not legislative proposals or reports — and may be modified with the CEQ's consent when emergency circumstances, expense to the Government, or impaired program effectiveness make modification appropriate.

Q: 18. What is the CEQ's role in the 102 process?

A: As the agency supervising the whole Section 102 process, the Council must pay special attention to maintaining the "traffic rules" for the flow of reports, leaving most substantive comments to the particular "expert" agencies.

The Council also serves as advisor to the President on environmental questions. In this capacity the Council may comment on particularly important or controversial projects and suggest what courses of action might be followed.

Q: 19. What effect has the Section 102 process had?

A: Federal agencies have taken, modified, and avoided actions on the basis of the NEPA environmental analysis. For example, the Corps of Engineers refused to grant some dredge and fill permits in order to protect ecological and aesthetic values. The Corps also has suspended some water resource projects pending consideration of the environmental impacts. The Coast Guard has denied several bridge construction permits to avoid adverse environmental consequences. The Forest Service switched from clearcutting to selective cutting in a National Forest, the Department of Transportation reconsidered several proposed Interstate Highway routes, and the Department of Defense amended plans for munitions disposal.

(For a fuller discussion of this question see the CEQ's Second Annual Report, pp. 25-27 and Chapter V, "The Law and the Environment.")

Q: 20. What legal rights does the citizen have under NEPA?

A: Most courts have concluded that the NEPA "102" environmental statement procedure is court enforceable at the suit of interested citizens. The extent of the citizen's right to sue is still being defined by the courts, particularly since it is linked to broader questions of administrative law, such as scope of judicial review, "standing," sovereign immunity, etc. (see Chapter V "The Law and the Environment," of the Council's Second Annual Report for more detailed information).

APPENDIX C

SOURCES FOR ENVIRONMENTAL IMPACT STATEMENTS*

In order to receive more efficient and prompt service, requestors are urged to order draft and final impact statements from the Department of Commerce's National Technical Information Service (NTIS) rather than the preparing agency. Each statement will be assigned an order number that will appear in the 102 Monitor (at the end of the summary of each statement) and also in the NTIS semi-monthly Announcement Series No. 68, "Environmental Pollution and Control." (An annual subscription costs $5.00 and can be ordered from the NTIS, U. S. Department of Commerce, Springfield, Virginia 22151.)

Final statements will be available in microfiche as well as paper copy. A paper copy of any statement can be obtained by writing NTIS at the above address and enclosing $3.00 and the order number. A microfiche costs $0.95. (Paper copies of documents that are over 300 pages are $6.00.)

NTIS is also offering a special "package" in which the subscriber receives all statements in microfiche for $0.35 per statement.

Statements will still be available for public scrutiny in the document rooms of the various agencies. However, only limited copies will be available for distribution.

Yet another possible source of statements is from the Environmental Law Institute, 1346 Connecticut Avenue, N.W., Washington, D.C. 20036. To order a document, please indicate the Department, date, and ELR Order # (given at the end of each summary). The Institute charges $0.10 per page, and as you will note the number of pages is also given at the end of the summaries. Please enclose the correct amount of money with your order and mark the envelope to the attention to the "Document Service."

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* From: "102 Monitor" Volume 1, Number 10, November 1971.

APPENDIX D

SOURCE FOR BACK ISSUES OF THE 102 MONITOR*

Because the supply of past issues of the 102 Monitor is not sufficient to meet all requests, a list is provided below indicating where the various issues of the 102 Monitor appeared in the Congressional Record. You may wish to order these Congressional Records from the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 ($.25 per copy).

Vol. 1, Nos. 1, 2 & 3

Congressional Record - April 28 (Extension of Remarks), Page E 3607

Vol. 1, No. 4

Congressional Record - May 27 (Extension of Remarks), Page E 5151

Vol. 1, No. 5

Congressional Record - June 16 (Extension of Remarks), Page E 6023

Vol. 1, No. 6

Congressional Record - July 28 (Extension of Remarks), Page E 8458

Vol. 1, No. 7

Congressional Record - Sept. 13 (Extension of Remarks), Page E 9483

Vol. 1, No. 8

Congressional Record - Sept. 24 (Extension of Remarks), Page E 10002

Vol. 1, No. 9

Congressional Record - Nov. 1 (Extension of Remarks), Page E 11596

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* From: "102 Monitor" Volume 1, Number 10, November 1971.

APPENDIX E

Summary of 102 Statements Filed with the CEQ Through 11/30/71
(By Agency)

Agency	Draft 102's for actions on which no final 102's have yet been received	Final 102's on legislation and actions	Total actions on which final or draft 102 statements for federal actions have been received.
Agriculture, Department of	45	90	135
Appalachian Regional Commission	1	0	1
Atomic Energy Commission	27	24	51
Commerce, Department of	1	7	8
Defense, Department of	3	2	5
Air Force	1	3	4
Army	6	5	11
Army Corps of Engineers	149	265	414
Navy	6	4	10
Delaware River Basin Commission	3	0	3
Environmental Protection Agency	3	9	12
Federal Power Commission	14	5	19
General Services Administration	16	19	35
HEW, Department of	0	1	1
HUD, Department of	10	10	20
Interior, Department of	47	35	82
International Boundary and Water Commission--U. S. & Mexico	1	4	5
National Aeronautics and Space Admin.	16	6	22
National Science Foundation	2	0	2
Office of Science and Technology	0	1	1
Tennessee Valley Authority	11	2	13
Trans[illegible]rtation, Department of	868	416	1284
Trea[illegible], Department of	1	3	4
U. S. Water Resources Council	4	0	4
	1235	911	2146

*Separate 4 (f) statements not incorporated in 102 statements received from DOT are not included.

Summary of 102 Statements Filed with the CEQ Through 11/30/71
(By Project Type)

	Draft statements for actions on which no final statements have yet been filed	Final statements on legislation and actions	Total actions on which final or draft statements for federal actions have been taken
AEC nuclear development	8	7	15
Aircraft, ships & vehicles	0	5	5
Airports	26	116	142
Buildings	0	5	5
Bridge permits	14	4	18
Defense systems	2	2	4
Forestry	2	4	6
Housing, urban problems, new communities	8	6	14
International boundary	4	2	6
Land acquisition, disposal	12	24	36
Mass transit	3	1	4
Mining	5	1	6
Military installations	11	3	14
Natural gas & oil			
Drilling and exploration	3	5	8
Transportation, pipeline	3	3	6
Parks, wildlife refuges, recreation facilities	9	14	23
Pesticides, herbicides	7	10	17
Power			
Hydroelectric	18	4	22
Nuclear	24	16	40
Other	15	1	16
Transmission	6	6	12

Railroads	0	1	1
Roads	702	273	975
Plus roads through parks	119	20	139
Space programs	6	2	8
Waste disposal			
Detoxification of toxic substances	4	1	5
Munition disposal	2	3	5
Radioactive waste disposal	1	1	2
Sewage facilities	2	5	7
Solid wastes	1	0	1
Water			
Beach erosion, hurricane protection	2	20	22
Irrigation	16	9	25
Navigation	39	94	133
Municipal & industrial supply	4	1	5
Permit (Refuse Act, dredge and fill)	7	0	7
Watershed protection & flood control	115	221	336
Weather modification	8	3	11
Research & Development	13	6	19
Miscellaneous	14	12	26
	1235	911	2146

From: "102 Monitor," Volume 1, Number 11, December 1971.

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APPENDIX F

Environmental Impact Statements
Federal Agency Contacts

Department of Agriculture

Dr. T. C. Byerly
Office of the Secretary
Washington, D.C. 20250
(202) 388-7803

Department of Defense
Department of Air Force

Col. Cliff M. Whitehead
Room 5E 425, Pentagon
Washington, D.C. 20330
(202) OX 5-2889

Department of Army
Corps of Engineers

Francis X. Kelly
Assistant for Conservation
Liaison, Public Affairs Office
Office, Chief of Engineers
1000 Independence Ave., SW
Washington, D.C. 20314

Office of the Assistant Secretary

Col. William Gardiner
Chief of Construction Division
Office, Deputy Chief of Staff
for Logistics
Washington, D.C. 20330
(202) OX 4-4380

Environmental Protection Agency

Mr. George Marienthal
Acting Director of Environmental
Impact Statements Office
1750 K Street, N.W.
Room 440
Washington, D.C. 20460
(202) 254-7420

General Services Administration

Rod Kreger
Deputy Administrator
GSA-AD
Washington, D.C. 20405

Department of Housing and Urban Development

Richard H. Broun
Director, Environmental &
Land Use Planning Division
Washington, D.C.
(202) 755-6186

Department of Interior

Office of Communications
Room 7214
Washington, D.C. 20240
(202) 343-6416

National Aeronautics and Space Administration

Ralph Cushman
Special Assistant, Office of
Administration
Washington, D.C. 20546

Tennessee Valley Authority

Dr. Francis Gartrell
Director, Environmental
Research and Development
720 Edney Building
Chattanooga, Tennessee 37401

Department of Transportation

Martin Convisser
Director, Office of Program
Co-ordination
400 7th Street, SW
Washington, D.C. 20590
(202) 462-4357

U. S. Water Resources Council
Ohio River Basin Commission

Fred E. Morr
Chairman, ORBC
1427 4th and Walnut Building
Cincinnati, Ohio 45202

APPENDIX G

SELECTED REFERENCES

Environmental Quality. The First Annual Report of the Council on Environmental Quality. Washington, D.C., U. S. Government Printing Office. August, 1970.

Environmental Quality. The Second Annual Report of the Council on Environmental Quality. Washington, D.C., U. S. Government Printing Office. August, 1971. (This second report includes much data on the environment and some types of impacts. Chapter 5, "The Law and the Environment", may be of particular interest to some readers.)

Harvard University, Graduate School of Design. Three Approaches to Environmental Resource Analysis. Washington, D.C.: The Conservation Foundation. 1967. (This booklet reports on three resource analysis techniques: that of G. Angus Hills, University of Toronto; Philip H. Lewis Jr., University of Wisconsin; Ian L. McHarg, University of Pennsylvania. Of particular interest in landscape design and regional planning processes).

Leopold, Luna B.; Clark, Frank E.; Hanshaw, Bruce B.; and Balsley, James R. A Procedure for Evaluating Environmental Impact, Geological Survey Circular 645. Washington, D.C.: U. S. Geological Survey, 1971. (This procedure and accompanying matrix for identifying and evaluating environmental impacts is the most widely disseminated. It has been applied once in a draft EIS by the Bureau of Reclamation. The authors are anxious to receive comments from agencies and individuals.)

Neiman, Bernard J. Jr., and Allen H. Miller. Interstate 57: An Application of Computers to Highway Location Dynamics. Environmental Awareness Center, University of Wisconsin, Madison, Wisconsin. Undated.

Sorensen, Jens C. A Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone. Published Master's dissertation, Department of Landscape Architecture, University of California, Berkeley, 1971. (Includes four Matrices for identifying possible adverse impacts. These matrices were distributed to all conference participants and examined during the presentation and discussion.)

U. S. Council on Environmental Quality. "102 Monitor" (Each issue of the "102 Monitor" provides a summary of draft and final 102 (2) (C) statements filed with the Council on Environmental Quality and other information related to Council activities. As of November, 1971, the availability of 102 statements and comments is listed weekly in the Federal Register.)

U. S. Federal Register. Council on Environmental Quality - Implementation of National Environmental Policy Act - Notice of Opportunity for Public Comment on Procedures. Vol. 36, No. 239, Part II, December 11, 1971. (Entire issue devoted to agencies procedures for implementing NEPA and CEQ's guidelines. Procedures previously published are not included but are indexed to indicate where they can be located.)

U. S. Federal Register. Council on Environmental Quality - Statements on Proposed Federal Actions Affecting the Environment - Guidelines. Vol. 36, No. 79, Part II, April 23, 1971.

University of Georgia, Institute of Ecology. Optimum Pathway Matrix Analysis Approach to the Environmental Decisionmaking Process - Test case: Relative Impact of Proposed Highway Alternates, 1971. (Mimeographed) (A study of alternative routes for highway I-75 north from Marietta, Georgia prepared for the State Highway Department.)

APPENDIX H

CONFERENCE PARTICIPANTS

Environmental Impact Analysis Conference
Green Bay, Wisconsin
January 5-6, 1972

Anderson, Charles
U. S. Forest Service
Route 2 Manor Road
Rhinelander, Wisconsin 54501

Arendt, David
University of Wisconsin-Green Bay
Green Bay, Wisconsin 54302

Armstrong, John
Director, Sea Grant Program
University of Michigan
Ann Arbor, Michigan 48104

Austin, Wilbur
University of Wisconsin-Green Bay
Green Bay, Wisconsin 54302

Barton, Michael
Deputy Forest Supervisor
Ottawa National Forest
U. S. Forest Service
Ironwood, Michigan 49938

Beattie, Hugh
Superintendent
Isle Royale National Park
National Park Service
Houghton, Michigan 49931

Beatty, Marvin
Director
Environmental Resources Unit
University of Wisconsin Extension
215 N. Brooks
Madison, Wisconsin 53715

Beckerley, James
U. S. Atomic Energy Commission
Division of Radiological &
Environmental Protection
Washington, D.C. 20545

Bernhagen, William
Institute of Environmental Studies
University of Wisconsin
437 Witte Hall
Madison, Wisconsin 53706

Burroughs, Tom
Project Assistant
News and Publications
University of Wisconsin
Madison, Wisconsin 53706

Besadny, C. D.
Director
Bureau of Environmental Impact
Wisconsin Dept. of Natural Resources
Box 450
Madison, Wisconsin 53701

Bouchard, Thomas
Assistant Professor
Department of Geography
University of Wisconsin-Eau Claire
Eau Claire, Wisconsin 54701

Brende, Herbert
Environmental Development Engineer
Wisconsin Division of Highways
Madison, Wisconsin 53702

Bruss, Lyle
Director of Facilities Planning
University of Wisconsin-Green Bay
Green Bay, Wisconsin 54302

Bunde, Dennis
Research Assistant
Environmental Awareness Center
B105 Steenblock Library
University of Wisconsin
Madison, Wisconsin 53706

Cavanaugh, John
Soil Conservation Service
U. S. Department of Agriculture
P. O. Box 4248
Madison, Wisconsin 53711

Chandler, Robert
Assistant to the Director
National Park Service
2510 Dempster Street, Room 214
Des Plaines, Illinois 60016

Conti, Enrico
Asst. for Environmental Affairs
Atomic Energy Commission
Chicago Operations Office
9800 S. Cass Avenue
Argonne, Illinois 60439

Cook, Robert
Associate Professor
Environmental Control
University of Wisconsin
Green Bay, Wisconsin 54302

Cooper, Rollin
Center for Recreation Resources
University of Wisconsin
Madison, Wisconsin 53706

Davidson, Norman
Pictured Rocks National Lakeshore
Box 40
Munising, Michigan 49862

Davy, William
U. S. Army Corps of Engineers
Kewaunee Project Office
Kewaunee, Wisconsin 54216

Dickerson, Russ
University of Wisconsin
Green Bay, Wisconsin 54302

Ditton, Robert
Assistant Professor
Leisure Sciences
University of Wisconsin
Green Bay, Wisconsin 54302

Dmoch, Thomas
Department of the Interior
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Dunn, Ben
Tennessee Valley Authority
49 Evans Building
Knoxville, Tennessee 37662

Ellison, Hank
Wisconsin Division of Highways
District #3
1125 N. Military Avenue
Green Bay, Wisconsin 54303

Faulkner, Clarence
U. S. Dept. of the Interior
Fish & Wildlife Service
Bureau of Sport Fisheries & Wildlife
Federal Building, Ft. Snelling
Twin Cities, Minnesota 55111

Fulk, T. A.
Environmental Planner
U. S. Forest Service
633 W. Wisconsin Avenue
Milwaukee, Wisconsin 53203

Giambusso, Angelo
U. S. Atomic Energy Commission
Division of Radiological &
Environmental Protection
Washington, D.C. 20545

Goodale, Thomas
Associate Professor
Leisure Sciences
University of Wisconsin
Green Bay, Wisconsin 54302

Harn, Joseph
Forest Supervisor
Ottawa National Forest
U. S. Forest Service
Ironwood, Michigan 49938

Haubert, John
Department of the Interior
Bureau of Outdoor Recreation
3853 Research Park Drive
Ann Arbor, Michigan 48104

Hess, Robert
Environmental Quality Section
Research and Development Division
Michigan Dept. of Natural Resources
7th Floor Mason Building
Lansing, Michigan 48926

Holt, William
Assistant Chief
Marine Environmental Coordination
Branch
U. S. Coast Guard
400 Seventh St., SW
Washington, D.C. 20590

Huddleston, Herb
Assistant Professor
Ecosystems Analysis
University of Wisconsin
Green Bay, Wisconsin 54302

Johnson, Edward
Environmental Protection Division
Office, Chief of Naval Operations
Room 4B 480 Pentagon
Washington, D.C. 20350

Johnson, Per
Assistant Professor
Urban Analysis
University of Wisconsin
Green Bay, Wisconsin 54302

Jowett, David
Associate Professor
Ecosystems Analysis
University of Wisconsin
Green Bay, Wisconsin 54302

Kelly, L. K.
Assistant to Regional Forester
U. S. Forest Service
633 W. Wisconsin Avenue
Milwaukee, Wisconsin 53203

Kessler, John
Assistant District Engineer
Federal Highway Administration
4502 Vernon Blvd.
Madison, Wisconsin 53705

Knox, Ben
Missouri State Park Board
1204 Jefferson Bldg.
Jefferson City, Missouri 65101

Kolka, Henry
Upper Great Lakes Environmental
Impact Council
University of Wisconsin-Eau Claire
Eau Claire, Wisconsin 54701

Krauskopf, Thomas
Research Assistant
Environmental Awareness Center
B105 Steenbock Library
University of Wisconsin
Madison, Wisconsin 53706

Kuehn, Jerome
Department of Natural Resources
555 Wabasha St.
Madison, Wisconsin 53704

Lindholm, Curt
Soil Conservation Service
U. D. Department of Agriculture
P. O. Box 4248
Madison, Wisconsin 53711

Lang, Vernon
U. S. Army Corps of Engineers
1594 Marion St., Apt. 202
St. Paul, Minnesota 55117

Lawyer, Donald
Assistant Chief
Environmental Resources Branch
U. S. Army Corps of Engineers
Washington, D.C. 20314

Luedtke, John
UIR-ISD
University of Wisconsin
1324 W. Dayton St.
Madison, Wisconsin 53706

Malone, John
General Services Administration
219 S. Dearborn St.
Chicago, Illinois 60604

Mann, Wayne
Forest Supervisor
Chequamegon National Forest
U. S. Forest Service
Park Falls, Wisconsin 54552

Mertens, Clem
Wisconsin Division of Highways
District #3
1125 North Military Avenue
Green Bay, Wisconsin 54303

Mundelius, Robert
U. S. Army Corps of Engineers
Kewaunee Project Office
Kewaunee, Wisconsin 54216

Nelson, Ken
Wisconsin Division of Highways
District #3
1125 N. Military Avenue
Green Bay, Wisconsin 54303

Nichols, Roland
Chairman
Department of Geography
University of Wisconsin-Eau Claire
Eau Claire, Wisconsin 54701

Orloff, Neil
Assistant Director
Environmental Protection Agency
Office of Federal Activities
Room 440
1750 K St., NW
Washington, D.C. 20460

Peterson, Michael
Planning Officer
Arizona Outdoor Recreation
Coordinating Commission
2222 West Greenway Road
Phoenix, Arizona 85023

Quigley, Jack
Department of Engineering
University Extension
432 N. Lake St.
Madison, Wisconsin 53706

Raduenz, Les
Landscape Architect
University of Wisconsin
Green Bay, Wisconsin 54302

Robkin, Eugene
Assistant Professor
Ecosystems Analysis
University of Wisconsin
Green Bay, Wisconsin 54302

Rogers, Robert
National Park Service
Box 27
Houghton, Michigan 49931

Ruedisili, Lon
Dept. of Geology & Geophysics
Science Hall
University of Wisconsin
Madison, Wisconsin 53705

Sager, Paul
Associate Professor
Ecosystems Analysis
University of Wisconsin
Green Bay, Wisconsin 54302

Slifer, Gordon
Impact Coordinator
West Central District Hdqrs.
Wis. Dept. of Natural Resources
1300 W. Clairemont Ave.
Eau Claire, Wisconsin 54701

Smith, Stewart
Attorney
Denissen, Kranzush, Stodola &
Mahoney
211 S. Monroe
Green Bay, Wisconsin 54301

Sorenson, Jens C.
Post Graduate Researcher
Institute of Urban & Regional
Development
University of California-Berkeley
1506 Oxford Street
Berkeley, California 94709

Steinhart, John
Associate Director
Center for Marine Studies
University of Wisconsin
1225 W. Dayton St.
Madison, Wisconsin 53706

Steinhauer, John
Wisconsin Division of Highways
District #3
1125 N. Military Avenue
Green Bay, Wisconsin 54303

Stephenson, David
Chairman
Water Resources Management Program
72 Science Hall
University of Wisconsin
Madison, Wisconsin 53706

Striegl, Albert
Civil Engineer
108 W. Wells St.
Room 352
Milwaukee, Wisconsin 53203

Stuiber, David
Sea Grant Program
University of Wisconsin
Lowell Hall
Madison, Wisconsin 53706

Troutt, Al
Forest Supervisor
Hiawatha National Forest
U. S. Forest Service
Escanaba, Michigan 49829

Van Demark, Peter
Institute for Environmental Studies
University of Wisconsin
437 Witte Hall
Madison, Wisconsin 53706

Wagener, William
University of Wisconsin
Green Bay, Wisconsin 54302

Warner, Maurice
Institute for Environmental Studies
University of Wisconsin
215 N. Brooks St.
Madison, Wisconsin 53706

Weimer, Linda
Publications Editor
Sea Grant Program
University of Wisconsin
1225 W. Dayton St.
Madison, Wisconsin 53706

Weidner, Edward W.
Chancellor
University of Wisconsin-Green Bay
Green Bay, Wisconsin 54302

Whalen, James
State Division of Highways
Wisconsin Dept. of Transportation
4802 Sheboygan Avenue
Madison, Wisconsin 53702

Williams, Gary
Environmental Impact Statement
Coordinator
Environmental Protection Agency
1 No. Wacker Drive
Chicago, Illinois 60606

Winter, Thomas
Council on Environmental Quality
722 Jackson Place, NW
Washington, D.C. 20006

Wood, Frances
Information Services Division
University of Wisconsin
1535 University Avenue
Madison, Wisconsin 53706

The American businessman is generous to a fault, but one thing he does demand of all teachers and lecturers and journalists: if we are going to pay them our good money, they've got to help us by selling efficiency and whooping it up for national prosperity! And when it comes to these blab-mouths, fault-finding, pessimistic, cynical University teachers, let me tell you that during this golden coming year it's just as much our duty to bring influence to have those cusses fired as it is to sell all the real estate and gather in all the good shekels we can.

——George Babbit (Sinclair Lewis)

The economic and political forces producing environmental deterioration are deeply entrenched and are likely to yield only to concerted and persistent public pressures to force public policy in the direction of protecting and enhancing the ecological systems that sustain life on this planet. The overwhelming need is to arrange an overdue marriage between economics and ecology; to bring the corporate system to realize that the earth is not only a vast storehouse of natural wealth to be drawn upon freely for our material well-being but is also our abode, the place we live and bring up our children and seek psychic sustenance.

——Richard Cooley, Geoffrey Wandesforde-Smith

Greatness is all right on the great plains; it is wholly inappropriate to a tiny fragile sphere . . . I take heart in . . . the realization that national greatness is too expensive and that the people of a modest nation have a much better time, or at least a better chance in the long run of a better time.

——Kenneth Boulding

This requirement (of NEPA) is not intended to be a mere formality. Nor is it intended to receive mere lip service. It demands no less than a revolution in the way we approach problems and make decisions.

——Russell Train

There is no British equivalent to your environmental impact statement, nor do I intend to have one. I personally think it is the duty of any government department to pursue high quality decisions in terms of the environment and they should be severely, publicly chastised if they don't. And I personally think the environmental impact statement, like a number of other decisions in the past, really makes a land fit for lawyers to live in with no great impact upon the environment itself.

——Peter Walker